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ABSTRACT

The Task Force on Women, Minorities, and the Handicapped in Science and Technology was established by the U.S. Congress in Public Law 99-383 with the purpose of developing a long-range plan for broadening participation in science and engineering. Public hearings were held in Albuquerque (New Mexico), Atlanta (Georgia), Baltimore (Maryland), Boston (Massachusetts), Chicago (Illinois), Kansas City (Missouri), and Los Angeles (California) between Fall 1987 and Spring 1988. The final report of the task force was produced in December, 1989. This document is the verbatim transcript of the public hearing. Dr. Howard Adams presided over the hearing. Following opening comments by Dr. Adams, speakers included: (1) Dr. Joseph T. Durham; (2) Dr. Homer D. Franklin; (3) Ms. Gertrude R. Jeffers; (4) a panel on the disabled (Dr. David Lunney, Dr. John Gavin, and Dr. Edward Keller); (5) Dr. Jo Wessels; (6) Mr. Ted Habarth; (7) Dr. Jerry Teplitz; (8) Dr. George Carruthers; (9) Dr. Howard Adams; (10) Mr. Thomas G. Sticht; (11) Ms. Ann Kahn; (12) Mr. Clennie Murphy; (13) Dr. Harold W. Stevenson; (14) Ms. Freda W. Kurtz; (15) Dr. Rita Colwell; (16) Dr. Janice Petrovich; (17) Dr. Barbara Mandula; (18) Dr. Lucy Morse; (19) Dr. Carol Weathers; (20) Mr. Daniel Thomas; (21) Ms. Marilyn Krupshaw; and (22) Dr. Michele Block. (CW)

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ED317395

TASK FORCE ON WOMEN, MINORITIES, AND THE HANDICAPPED IN SCIENCE AND TECHNOLOGY

PUBLIC HEARING

REPORT OF PROCEEDINGS of a public hearing of the Task Force on Women, Minorities and the Handicapped in Science and Technology held on the 4th day of May, 1988, at the Community College of Baltimore, Harbor Campus, Baltimore, Maryland, and presided over by DR. HOWARD ADAMS.

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DR. ADAMS: Good morning. We have a few housekeeping things that we need to get done before we actually start on our hearings today, and in the meantime we also [INAUDIBLE] pieces of this equipment.

As you know, most of the Task Force members had to come in from Washington this morning and we were unaware that there was a parade going on [INAUDIBLE], and for that reason some people will be coming in [INAUDIBLE].

I would like to welcome all of you to our seventh and last public hearing for the Task Force on Women, Minorities and the Handicapped in Science and Technology.

I am not one of the Co-Chairs of the Committee, and I want to let you know that as we start this morning. I am officiating for Dr. Ann Reynolds and Mr. Jaime Oaxaca, who are the Co-Chairs of the Committee, both who were unable to attend this meeting today.

My name is Howard Adams and we will try to keep ourselves scheduled as we go along.

I would like to take this opportunity to thank Dr. Durham, who is the President of the Community College of Baltimore for his hosting us today and for the [INAUDIBLE] for our being able to have a successful hearing.

In terms of guidelines for the proceedings, we will ask that the persons who are testifying, if you will come to the table and use the mikes. You will be allowed 10 minutes, in general those persons who have been approved by [INAUDIBLE] to present today.

[INAUDIBLE] and a bell will go off. At that time, you will have a minute left. It has been our history that people continue to try to go on after that, and we will kind of cut you off because we need to stay pretty much on that schedule in order to get everybody in.

If you have additional kinds of information, we would hope that you would make that available to us in writing, and by all means, please submit a written report to the available persons.

At the end of each 10-minute session, there will be some time for the members of the Task Force to ask questions as they [INAUDIBLE] try to get those questions outlined so that we can move on as quickly as possible [INAUDIBLE].

After the scheduled testimony, there is an opportunity for persons who have not had a chance to [INAUDIBLE] for some persons to also be allowed three minutes to present their testimony to the Task Force, and we will have as many of those as we can at the end of the morning session and again at the end of the afternoon session.

If you are interested in doing that, there will be an opportunity to sign for that from some sign-up cards that are on the desk as you came into the main room.

You will note that there is a person to my right, to your left, who is signing for the deaf. I would ask at this time if there is anyone is the room who in fact needs that service. Is anyone who is deaf in the room? The answer is no then. We will check later on during the course of the hearing to see if someone has come in and if so, that person will be available to us. Thank you very much for doing that.

As we move to the scheduled presenters, the first person who was supposed to have presented this morning was the Honorable Helen Bentley, Congresswoman from the 2nd District. But due to a bill that is now pending and is on the floor this morning, she will be [INAUDIBLE] until 10.

And so we will move right on to Dr. Durham's presentation. Dr. Durham is the President of the Community College of Baltimore.

DR. DURHAM: Thank you, Chairman Adams. Good morning, ladies and gentlemen of the Task Force. I had the opportunity to visit with the Task Force. I met many of you in the city of Atlanta. I enjoyed that meeting a great deal, and I assure you that we're happy that the Community College of Baltimore will serve as the site for which I think is the seventh and last hearing.

As the President of the Community College of Baltimore, I am delighted to welcome the Task Force to the city and to the campus.

As an urban community college, with all that that term implies, we welcome the Task Force because we believe that the basic premise which undergirds your work, namely the premise that the national welfare rests ultimately on our willingness to ensure the optimum development of each and every citizen of our country.

A similar premise undergirds community college education. Our community colleges are accessible, they are low-cost, they are open admissions systems, and they offer opportunity with excellence.

Before I make my prepared statement, I would like to express [INAUDIBLE] Jeffers, a member of this Task Force and the Chairman of our Board of Trustees, his regrets that he is not able to be in attendance at today's hearings.

He continues to have a [INAUDIBLE] interest in the activities of the Task Force, however, the demands of his schedule have kept him from attending. We are, however, [INAUDIBLE] able to have Mrs. Jeffers, who will represent the Jeffers household on another [INAUDIBLE], and she will speak to you shortly.

I would want to, in my prepared remarks, make recommendations to address the current status of women, minorities, and the handicapped [INAUDIBLE] more fully into the area of science and technology.

The first recommendation establishes a system of early identification.

The second, that proposes a system to redirect human talent from existing low-income jobs.

And the third, utilizing community colleges as a natural [INAUDIBLE] to the baccalaureate degree and gradually for students.

Let me deal with each one of these individually.

In terms of a system of early identification, women, minorities, and the handicapped must be targeted for science and technology careers as early as the junior high or middle school and perhaps even earlier, in elementary school.

A program should emphasize counseling and mentoring that are combined with emphasis on lab sufficiency and science enrichment. Such programs are essential.

Also in this connection with early identification, some exploration of science and mathematics in the natural world [INAUDIBLE] and motivate these young people.

The problems of college scholarships can be tied to attendance and success in prescribed math and science courses. And incidentally, in connection with this, in the city of Baltimore, we have an organization known as the Greater Baltimore Committee, and that in connection with the public schools of this city, has developed a system whereby all of the students who achieve a 95 percent attendance [INAUDIBLE] and who have a certain prescribed scholastic average will be assured admission even to college or assured [INAUDIBLE] or jobs, once they finish high school. That's in connection with [INAUDIBLE] for scholarship.

And also an early identification [INAUDIBLE] industry and higher education and about key schools. I'm sure that most of you are aware of the magnet school idea. For example, in

Baltimore, we have several kinds of special schools. There are schools for [INAUDIBLE], school for pregnant teenagers, and the Western High School, which is a school for young [INAUDIBLE].

These could be started for model programs to be [INAUDIBLE].

When we started to accept the recommendations, systems which [INAUDIBLE] from dead-end and low-paying jobs, and they are of major concern. The women, minorities, and the handicapped in the workplace is with those who are stuck at low-level jobs. This large pool comprises a large portion of America's untapped, undertrained talent.

Companies in Baltimore, such as the Baltimore Gas & Electric Company, [INAUDIBLE] the telephone company, have expressed their intent to retrain and upgrade undertrained women and minorities for these, to fill emerging jobs in engineering and computer science.

These programs will need to include counseling for career redevelopment, reassessment of levels of self-esteem, and methods to overcome mathematics anxiety.

These components can be [INAUDIBLE] with academic output and scheduled like the [INAUDIBLE]. The community college is an ideal learning system for this retraining component, and at the Community College of Baltimore we are always engaged in some of this with the Baltimore Gas & Electric Company.

And then finally, I have talked with you, members

[INAUDIBLE] about the lack of connectedness and post-secondary education. The community college can serve as a natural bridge to careers in the sciences and technology for minorities, women, and the handicapped.

For the past 20 years, community colleges have been the [INAUDIBLE] education of the United States. Presently, there are more than 400 community colleges, which enroll more than 5 million students.

More than half of all college freshmen in the country begin their post-secondary program at the community college. A large percentage of these students are low-income, minority, and women.

The community colleges, specifically the urban community colleges, are the main entry points to higher education, not only for Blacks, Hispanics, and Native Americans, but also for women and the handicapped.

Programs such as the Career [INAUDIBLE] Opportunities in Science and Technology for Minorities, Women, and the Handicapped; Minority Institutional Science Improvement Program; Hospitals' Opportunity Program, and the [INAUDIBLE] Program, a prime example of federal initiative, which encourage educational [INAUDIBLE] between the high school, community college, and the university.

These [INAUDIBLE] most effectively for students [INAUDIBLE] minorities, women, and handicapped, who are prepared in science and technology.

At the Community College of Baltimore, a new science option, a marine biotechnology, which was updated into that [INAUDIBLE] in collaboration with business and industry.

Women, minorities, and the handicapped are going to be targeted for participation in this [INAUDIBLE] and the opportunity that they will have available at our college.

And so, Mr. Chairman, [INAUDIBLE] that I began, that the community college is low cost and open admissions institutions. They offer opportunities for education with excellence. And I urge that they not be overlooked as you consider making [INAUDIBLE] of the science and technology field more open for women, minorities, and the handicapped.

I will be happy to [INAUDIBLE] [BELL].

DR. ADAMS: OK, Dr. Durham. [INAUDIBLE].

MS. MEJIA-WALGREEN: Dr. Durham, do you have available or can you find for the Task Force, what percent of your students go on to four-year institutions?

DR. DURHAM: Roughly 30 percent of our students transfer to four-year upper-level institutions. The greater Baltimore students go directly to [INAUDIBLE]. However, that percentage is somewhat defective because, as you know, there is a back-and-forth movement for persons between community colleges and even four-year institutions.

We find some students who come back from the four-year institutions, even if for a brief program in the summer, to finish their course, or even some students will have completed a degree at the four-year institution and they want to be returning [INAUDIBLE].

DR. MALCOM: Do you have any information as to how, what percentage of these [INAUDIBLE].

?: It's difficult to hear down here.

DR. MALCOM: Do you have information about how your percentage of transfers compares to the overall national figures for community colleges for transfers?

And in particular do you have any idea how these might compare to [INAUDIBLE]?

DR. DURHAM: I am not sure what percentage of the national, in terms of the transfers, but I understood that our 30 percent was somewhat very close to what the national average is for transfers.

We do, however, get [INAUDIBLE] on our students. We get some information from the institutions to which they transfer, even directly from the institutions themselves because of the contact that we make with these institutions.

And we also get them from community college [INAUDIBLE] meetings or boards. The comparison of our students in relationship to the other students who come from the other 15 junior colleges in the state of Maryland, and they go on to the [INAUDIBLE].

DR. CARTER: Could you talk a little bit in general about the source of funding for community colleges, not so much yours, for example, but if the low-cost and who subsidizes them?

DR. DURHAM: Yea, the question is very much on my mind right now because we are in the whole midst of budgets and preparation and so on. But any state that [INAUDIBLE]], by law, there are three factors that would guide the funding for Maryland community colleges [INAUDIBLE].

Fifty percent of budget comes from the state of Maryland; 28 percent comes from the lower government, in our case, the city of Baltimore; and the remaining 22 percent comes from student fees and tuition.

However, that is changing. The state of Maryland now defines as a result of the last General Assembly, which has determined that [INAUDIBLE] the whole funding for minorities will change, primarily because the original funding [INAUDIBLE] that very largely enrollment [INAUDIBLE].

It came about in the sixties, that the community colleges were in the [INAUDIBLE] rapid growth and so on, and now with the changing demographics [INAUDIBLE] slowed them down, it became a pattern that the enrollment [INAUDIBLE] was not very possible for the present situation.

So now the funding for the state has been changed to reflect more of the [INAUDIBLE] of the local subdivision in which the college is located.

One other thing I should indicate is that with the 22 percent that I talked about in terms of student funds, I gather the basis of the [INAUDIBLE]. More and more we find that because the governments are restricting the amount of money that they are given, particularly out of the city of Baltimore, the colleges are finding it necessary to increase their tuition, which works against the very thing that we are talking about--low-cost tuition for students.

And [INAUDIBLE] we can address that, we are trying to do that through private funds--we have set up a foundation, and many community colleges have foundations, and that gives us some discretionary [INAUDIBLE], and we have been talking with business and industry, even about providing some instructors and [INAUDIBLE] maybe even making some financial contributions to the institution.

DR. JENKINS: Dr. Durham, I am intrigued by your second recommendation of reclaiming the undertrained. I wonder if the process has been going on long enough that you can share some information with this Task Force.

How realistic is it in terms of filling the needs of the changing demographics for the year 2000? Can you help us there?

DR. DURHAM: It was, I think just about a year or so that we have gone into that. We have done several things. One, as I mentioned, with Baltimore Gas & Electric Company [INAUDIBLE] training. We are doing something presently in relationship to the initiative started by the National Endowment, which [INAUDIBLE], but that was retraining persons who have low scales in terms of [INAUDIBLE].

We also are working with the Baltimore Public School System in that [INAUDIBLE] adult education program from the Baltimore Public School System to the [INAUDIBLE].

But I would judge that we are not doing well enough to really get [INAUDIBLE].

DR. ADAMS: Thank you, Dr. Durham, for those recommendations. I would like to suggest to you as you [INAUDIBLE] that I would be very interested in, since we're trying to work with federal agencies, and [INAUDIBLE] some things that the National Science Foundation and the Department of Education, if you have some other recommendations for us [INAUDIBLE] some of the other agencies would be more than happy to [INAUDIBLE] as we look at things like the Department of Defense, the Department of Energy, some other places where those agencies make some key statements to us as to what we might do, i.e., some of the things, the kinds of things you talk about in these recommendations [INAUDIBLE].

DR. DURHAM: Thank you, Dr. Adams, I would be happy to do that [INAUDIBLE] we've made the application to the National Science Foundation, and we're hopeful that that will receive a favorable reading. I think the early education [INAUDIBLE].

DR. ADAMS: Thank you very much.

DR. DURHAM: Thank you.

DR. ADAMS: [INAUDIBLE] to testify is Dr. Homer D. Franklin from Olive-Harvey College. This is [INAUDIBLE]

Chicago.

DR. FRANKLIN: Ladies and gentlemen, [INAUDIBLE], good morning, and I would like to thank you for the opportunity to testify before you this morning.

My name is Homer D. Franklin and I am President of Olive-Harvey College, a two-year institution [INAUDIBLE] of the City Colleges of Chicago.

My professional life is concerned with aid to education, and I have had the opportunity to look at all races, including Blacks and other minorities.

First, in the Chicago Public School System, and for the last 18 years with the City Colleges of Chicago.

My field of study is biology. This background makes me profoundly interested in the subject of this hearing and the focus of the Task Force itself.

As an educator and scientist and as one who is committed to the education of all students, and especially to the education of minority students, I am concerned that we have far too much--or far too little access for minorities to higher education in general and to the sciences and technology specifically.

As the President of a community college, I would like to share with you the role our institutions can play in making sure that minorities are not shut out of this important field.

At present we are [INAUDIBLE]. We are a two-year college enrolling about 3,300 students in our present programs, and a similar number in our adult learning skills programs.

Our school population is 87 percent Black, 6 percent Hispanic, and 7 percent white.

Geographically, we serve [INAUDIBLE] Chicago. Our primary service community has changed greatly over the last 25 years. It is now estimated to be 71 percent Black, 9 percent Hispanic, and 20 percent white.

It is true that many of our students are low income. Over 70 percent of our students qualified this past year for financial aid.

It is a fact, however, that our service area is not the poorest of the city. The estimated median income for our area in 1980 was $22,000.00, while for the city of Chicago as a whole, it was $18,776.00.

Olive-Harvey offers, among others, a program in computer [INAUDIBLE] technology. The associate in applied sciences degree culminates in a program, prepares students for entering the labor force in the active field of computers, as diagnosticians and repair persons.

The last few years our enrollment in this program has decreased at a rate higher than the overall enrollment at the college.

In 1984, there were 867 declared majors in this field. In 1985, there were 675. In 1986, the number was 473. It has established somewhat--or it has stabilized somewhat in 1987 at 435.

To us, even taking into account factors specific to the City Colleges of Chicago, this decrease in enrollment is a disturbing [INAUDIBLE] of the status of minorities in the field of science and technology as a profession.

We see it on our campus. It's the other side. Our colleges offer a variety of courses in math and science. Our core [INAUDIBLE] a variety of requirements in science and mathematics.

While these courses are not designed as a step to professional, sciences and technology as a career, they represent the foundation upon which our students can build their preparation for science and technology careers, to be pursued either on our campus or as they transfer to four-year institutions.

After a [INAUDIBLE], a table of enrollments by our students in math and physical and biomedical sciences, the figures show that a number of our students who are taking science courses is [INAUDIBLE].

In mathematics as well as programs-specific requirements in most of our curriculum, including business, liberal arts, and others, enrollment never goes above [INAUDIBLE] percent of our students.

Biology and physical sciences, again, are required for our core curriculum. Enrollment is 16 percent of our students. And those courses, without being professional in nature, [INAUDIBLE] more advanced level science instruction, enrollment is low.

The relevance of this is the fact that unless the general school population receives the student expanded levels of what we call "science literacy," we cannot expect to identify and develop the kind of students who will pursue the sciences in a professional way.

It is this level of acquaintance where the knowledge of science and mathematics that is low among our students. We recognize that one major reason for this resides in the level of preparation in the exact sciences that a student brings with them as a result of their elementary and secondary school experience.

/ As part of our admissions process, we assess our students who are enrolled in the first [INAUDIBLE]. We [INAUDIBLE] success in English, reading, and mathematics.

Let's look at our results in math. [INAUDIBLE] to ascertain levels of student familiarity [INAUDIBLE] advanced sciences. We use the College Board [INAUDIBLE] skills.

In 1987, we tested 1,390 entering students. Of those, only 17.48 percent placed in college-level algebra.

In 1986, we tested 1,556 students, and of those, 10 percent placed in college-level algebra.

Clearly, the vast majority of our students who come to the college have yet to achieve a science level appropriate to post-secondary education. The college faces a very difficult task in bringing its students up to speed in science familiarity and knowledge levels in general, not to speak of bringing them to the point where they can make a decision to choose science and technology as a profession, with reasonable expectations of success.

The task of [INAUDIBLE] science and technology at an early level. The only thing secondary school [INAUDIBLE]. Does the community college, and you are concerned with the entire education process in our community.

We cannot accept our current student preparation levels as a deterrant to our involvement of the science and technology levels of our communities.

[INAUDIBLE] has, therefore, undertaken a series of activities to affect students learning science. We approach it at different levels, with our own students.

One of our most successful programs has been to make a science and technology [INAUDIBLE]. We attempt to raise expectations [INAUDIBLE].

Currently, over 100 of our students graduating with an associate degree in applied science, computer electronics, and data processing have been hired by AT&T Bell Laboratories in [INAUDIBLE].

Most of them are taking advantage of the company's employee development policy and are continuing the course work towards a bachelor's degree in engineering or data processing.

Our alumni of the college [INAUDIBLE] current students as role models and informal advisors. Company representatives visit our campus, welcome our students for visits to their facilities, and serve on the advisory board of our computer electronics program.

Our companies serve also on the advisory board.

We endeavor to therefore keep our programs consistent with the needs of business and to make our students aware of the opportunities present [INAUDIBLE].

On occasions, companies who also make contributions of equipment materials to our class. Through cooperative programs, we cooperate with employer institutions [INAUDIBLE], and our students aim at professional careers in sciences and engineering.

At the secondary level we cooperate with the schools in our community and a variety of campus-placed programs. For the Saturday Science Program, they selected out the best students in high school to attend additional classes on the campus in math and science on Saturday morning.

After school math and sciences enrichment programs for high school students, summer enrichment programs, again primarily math and science.

A particularly successful program initiated last year [INAUDIBLE] the course in preparing students for the ACT-SAT entrance examinations. Initial data on our results show an average pretest scoring of 8 out of a possible 36 points.

After the eight weeks of the course, scores are averaging 16 points. Data on this program is still being analyzed [INAUDIBLE].

At the elementary school levels, we hold summer learning camps on academics, again with the purpose of enrichment, and [INAUDIBLE] sciences.

We have computer literacy programs in the afternoon and weekends for elementary school students.

The [INAUDIBLE] report in the field of science and technology have pre-school children in the college's Child Development Center.

Under a careful research design, we tested for two years the ways in which children can learn about computers, when they have an opportunity to use them in informal settings.

The results suggest that while children learn a few skills needed to program computers, the most important gain from their exposure [BELL] and interaction was that the computer became a part of their daily lives.

Recommendations. There is a need to recognize the important role of community colleges in instructing in science and math. There should be training incentives for community college faculty [INAUDIBLE] science enrichment programs.

Projects such as computers and children should be increased.

There needs to be incentives for [INAUDIBLE] and development in sciences and math facilities and faculty in the elementary and secondary schools.

A major effort needs to be undertaken to provide community colleges with science and math resources. The role of community colleges in training elementary and secondary teachers of math and science needs to be reviewed and increased.

Community colleges need to encourage and provide the resources, plan and implement innovative programs to incite interest in sciences and math among precollege students.

Innovative programs for the average student coming to a community college need to be encouraged.

There is a need for increased cooperation between community colleges and science-oriented businesses that gives us [INAUDIBLE].

[INAUDIBLE] are strongly that access of minority to math careers will be a function of a general increase in math, science literacy in the science in the student community at large.

Only by fostering the general climate of science awareness can we hope to see the emergence of individuals within the general student population that can make a career out of science and technology. Thank you.

DR. ADAMS: Thank you, Dr. Franklin. I have one question that I would like to--legally, you're sort of dealing with this whole issue of undergrads at the precollege level, and we have been trying to decide where we would--how should we play the recommendation for having students, let's say, instead of [INAUDIBLE] make sure that they are taking out the one.

One of the problems that you have oft times is when you are talking about minority students, automatically it comes up that, technically, these students can't handle math, and so therefore the very ones that we're talking about were not [INAUDIBLE] in these programs.

Would you--or does it make any sense what a group like ours in fact recommends that in the United States we have [INAUDIBLE] requirement in seventh grade? So if you don't take algebra 1 in the seventh grade you're out of the math track. I mean that's just the system. You're never going to get back on because it's so sequential that if you take a basic math in the seventh grade, then the chances that you are going to get back to a real math class is very slim.

What would that do for Chicago?

DR. FRANKLIN: It would help a great deal, and I do think that the recommendations of the Task Force assume, include math as a requirement, certain specific levels of math as a requirement at various levels in the elementary and high school [INAUDIBLE].

DR. ADAMS: Ms. Bishop.

MS. BISHOP: Yes, excuse me, I have a question. You [INAUDIBLE] that you are working interactively with students at the elementary and high school, junior high and high school, and on the flip side...

DR. FRANKLIN: And pre-school.

MS. BISHOP: And pre-school, good. And on the other side with the businesses for employment. One might be concerned with cost. How are you getting your funding or are your programs so innovative that you are doing things other than what it takes in terms of resources--financial resources?

DR. FRANKLIN: Well, the ACT-SAT preparation includes pay, parents pay. For the computer literacy program for elementary school students, the parents pay.

For the Saturday Science Program, the state of Illinois funds us through a special grant because there is a shared grant between the University of Illinois and Olive-Harvey College.

On programs that are support--there are some programs which are supported by AT&T and [INAUDIBLE].

MS. BISHOP: Do I assume you have provisions for those parents who are unable to pay?

DR. FRANKLIN: Unfortunately, we do not now at this time.

DR. CLUTTER: Exactly how much do the parents have to pay.

DR. FRANKLIN: For the ACT-SAT preparation?

DR. CLUTTER: Yes.

DR. FRANKLIN: $75, our cost. For the computer literacy, $30, I think, for the semester or for an [INAUDIBLE] term, I'm not sure. But it is much less than the $75 for the ACT-SAT prep.

Now, Ms. Bishop, with regards to the computer lit course for the pre-school students who are in the [INAUDIBLE] development programs with computers, the Department of Public Aid does pay for parents who are unable to pay themselves.

DR. ADAMS: Dr. Williams.

DR. WILLIAMS: Yes, you spoke to the collaborative efforts you have in the K to 12 sector and the business sector for employment purposes. Are there comparable interactions or programs with the university?

DR. ADAMS: Still can't hear you.

DR. WILLIAMS: Are there comparable programs with the universities in the state of Illinois?

DR. FRANKLIN: Yes, there are. Specifically, the [INAUDIBLE] and not at the University of Illinois--very, very [INAUDIBLE] programs that support our math, science preparation for students to go into the engineering and science fields.

DR. WILLIAMS: If I'm permitted, a follow-up question. What percentage of your students...

DR. ADAMS: In the mike.

DR. WILLIAMS: The minority students, what percentage of your students actually make it in science fields, make the transition from community college to a four-year institution?

DR. FRANKLIN: Very, very small percentage [INAUDIBLE] about 37 students go in to four-year institutions, much less, about 10 percent, but there is a lot of back-and-forth interaction in [INAUDIBLE].

DR. ADAMS: All right. Thank you very much, and as we did have written testimony from Dr. Franklin, then that will be made available to the [INAUDIBLE].

DR. FRANKLIN: Thank you.

DR. ADAMS: Thank you, Dr. Franklin. Our next scheduled today is Ms. Gertrude R. Jeffers, Director of the Governor's Office for Handicapped Individuals.

MS. JEFFERS: Good morning. [INAUDIBLE]

DR. ADAMS: Would you pull the microphone closer to you, please. I can't hear.

MS. JEFFERS: I shall try and keep my remarks to 10 minutes. I shall warn you, however, that I'm a certified sign language interpreter and if I run [INAUDIBLE] and the mike turn off, I'll just keep signing. [laughter]

Good morning, Chairman Adams, and members of the Task Force. My name is Trudy Jeffers and I am the Director of the Governor's Office for Handicapped Individuals. My office is responsible for state-run policy initiatives and development programs for disabled citizens.

Unfortunately, Governor William Donald Schaefer could not be here today. However, on his behalf and of all Marylanders, we welcome you to Maryland.

Governor Schaefer has been a strong leader in the area of science and technology. His initiative to create a math-science high school in our state was a bold step which recognized the need for a focal point for our gifted high school students.

Unfortunately, this initiative did not pass the legislature in our last session. However, the Governor and his administration remain committed to providing opportunities for all Marylanders to excel in the areas of science and technology.

As you probably know, a major barrier for disabled individuals continue to face, as children and as adults, is an attitudinal one.

Indeed, there are those who believe disabled individuals have limited potential. This is especially detrimental at the pre-school and elementary levels, where disabled children's curiosity, like all children, is at its peak.

Given unbiased support and encouragement, disabled children can successfully pursue sciences and science-related studies. If we sensitize teachers, beginning at the elementary level, to facilitate a disabled child's natural curiosity and not stir up fear of him or her away from more challenging pursuits, such as science, we begin to address the prevailing obstacle.

But such sensitivity must follow the disabled child into middle school and high school. It is at the middle school level where changes in attitude alone, however, will not suffice.

If we are to fully mainstream disabled children, we must be creative and provide an accessibility to the science curriculum. Here, weakness is the teachers.

The State Department of Education Center for Technology in Human Disability [INAUDIBLE] a project with Johns Hopkins University and [INAUDIBLE] Rehabilitation Center, is conducting research into the use of computer-assisted learning in elementary schools here in Maryland and in Pennsylvania.

The results of this study bode well for our increased understanding of how disabled students can benefit from computerized instruction.

There is thus promise for science to be a more integral part of such instruction.

We must also accommodate students by modifying science laboratories and learning centers in high schools and college.

The federal government must take the lead in developing college recruitment, internship, and scholarship programs for disabled students who are interested in sciences.

Local governments must also do their part to develop internships and partnership with science and technology-related businesses.

The combination of academic training and practical experience is critical for students who are disabled. They are usually overlooked for such programs.

In addition, mentor and peer relationship programs must be part of an ongoing effort to support future science professionals who are disabled.

With those persons already in the science and technology fields who become disabled, the challenge is to develop specialized accommodations in order that they may continue in their chosen careers.

The federal government must take a leadership role in research and development activities in this regard.

In terms of the mentor-peer relationship programs I suggest, it would obviously be imperative to identify those disabled persons currently in fields of science and technology.

Unfortunately, efforts to collect such data have not been fruitful.

So I think one of the major challenges is to collect and regularly update such data.

We are excited with some local efforts to improve the quality of life for disabled Marylanders through the use of technology. If I may, I would like to share a few of these examples with you.

The eight-year-old Maryland-based organization, Volunteers for Medical Engineering, VME, is one example of our local efforts. VME consists primarily of engineers working for the Westinghouse Corporation here in the Baltimore area, as well as other interested individuals.

These volunteers apply their technical expertise to a variety of projects designed to assist disabled individuals. A part of the program [INAUDIBLE] curriculum of a disabled high school teacher has been computerized.

With VME's assistance, she has been able to continue teaching from her home.

In 1986, Maryland became the first state to enter into a public-private partnership to make computers available to disabled students. This partnership between the National [INAUDIBLE] Foundation and the Maryland State Department of Education has provided 2,500 computers to persons of all ages with disabilities.

The computers have been placed in the educational and rehabilitation system. The initial phase of the project is developing software packages to assist educators in defining and meeting student needs.

Later phases are to include the establishment of a statewide network validating the model and expanding its implementation in other areas.

The Center for Technology and Human Disability has two innovative projects during the first year and a half of operation. The Center's goal is to increase [INAUDIBLE] of and access to computers to disabled individuals between the ages of 16 and 64.

The Center has become a national model. The Center's Technical Resource Office offers individualized technology to enhance daily work and living experiences. After acquiring some skills, individuals may gain employment or be placed in the Center's Computer Training Project.

The Training Project is a [INAUDIBLE] which helps individuals gain experience with the various computer languages. Upon completion, students undertake internships with local businesses.

Upon completion of the internships, students are placed in paid positions. The project has an 85 percent placement rate, which is attributable to an active and committed business committee that advises the project.

These efforts here in Maryland represent commitments from government, private organizations, and business to open doors to technology to assist disabled persons improve the quality of their lives.

Through such exposure, and most importantly, at the earliest opportunity in school, it is our hope that disabled persons will be directed and encouraged to pursue careers or continue their careers in science and technology.

Thank you.

DR. ADAMS: Thank you, Dr. Jeffers. [BELL]

MS. JOSEPH: I'm just interested in the magnitude of your efforts. How much money [INAUDIBLE] spent on assistance to the handicapped individuals relating to education and job training? How many people are in the Westinghouse computer?

MS. JEFFERS: Those are difficult questions to answer. I think the aggregate, our special education budget is close to $100 million in this state. The Division of

Vocational Rehabilitation budget is $40 million. I think that those would be the two primary agencies involved with the education and rehabilitation of disabled individuals.

What percentage of that is devoted to technology and science, I don't know, and I'm not sure that it can be broken out, but we could certainly try to see if that setup could be identified.

MS. JOSEPH: I don't mean a science and technology quotient as much as the handicapped [INAUDIBLE], opportunities for the handicapped, education [INAUDIBLE].

MS. JEFFERS: Again, I can refer to the special education budget and its size, which is substantial, and it certainly serves every disabled student between the age of zero--in our state, we begin serving disabled children at the age of zero--through 21.

And our hope is that many of those students are being exposed to the sciences. Many of those students were mainstreamed [INAUDIBLE]. So they are [INAUDIBLE] of local school projects. And I'm not sure that that answers your question.

MS. JOSEPH: How large is your Westinghouse 85 percent employee-run project?

MS. JEFFERS: There are actually two separate projects. The Volunteers for Medical Engineering, I believe, has a regular membership of approximately 150 engineers and other interested individuals.

However, the program has been so successful that they are now a national organization and have chapters within, I would think, probably 10 to 15 cities across the country.

What they have done is focused on the defense industry as the area where they recruit volunteers, because the feeling is, the skills with which these engineers have the access which they have to hardware and software with their employers allows them in their free time to be very creative, in developing assistive devices for disabled individuals.

One of the examples that I could share with you in addition to my testimony here locally. John Scallen, who is the founder of VME, is the engineer primarily responsible for the [INAUDIBLE] technology, the radar technology [INAUDIBLE].

He has taken his skills and developed a [INAUDIBLE] that is designed for persons who are completely and [INAUDIBLE] and to communicate when they can no longer speak by placing a pair of glasses on an individual which have a laser attached to it.

I must the confess that technology is not my expertise, so it is going to be very rudimentary, my explanation. The person focuses on a personal computer screen, and by blinking can activate the computer to spell out whatever words that person wishes to communicate.

So it allows them to communicate where they have not been able to do so before. This technology was developed during John's free time while at Westinghouse, utilizing

Westinghouse's computer equipment, etc.

So it's difficult to put a price tag on that because of the free time and free access that Westinghouse has made available.

At the Center for Human--for Technology and Human Disability, I am not sure of the numbers of persons that have gone to either program. However, I do know that approximately 68 individuals a year are placed out of the computer training program.

DR. ADAMS: Dr. Danek.

DR. DANEK: Dr. Jeffers, I'm curious about your office. Could you tell us a little bit about your office and what it does?

The other thing I would like to know is it's my understanding that you are the Director of the office, is directly on the governor's cabinet.

MS. JEFFERS: That's correct.

DR. DANEK: And is that typical? Is that make that unique among states? Or is this kind of an office that exists in almost all states?

MS. JEFFERS: It's unusual. Let me give you a bit of background. My office was established in legislation in 1978. Our primary--we have several responsibilities, but our primary responsibility is to identify all programs serving disabled individuals from--as I put it--from womb to tomb.

All programs are for disabled children up through adulthood and into old age.

We identify those programs. We evaluate those programs. We obviously identify when gaps in programs exist for particular patients.

My primary responsibility is to focus on obviously state agencies for their services that we are rendering to get in touch with the disabled individuals throughout our state to determine what their needs are and to recommend to the governor and to the legislature means by which those needs could be met.

My responsibility is not a direct service responsibility. We do not provide services per se, but we rather try to coordinate services which are being rendered by various state agencies.

We have an advisory council, and when governor Shaeffer assumed responsibilities as governor of the state, he reorganized my office to bring in the Governor's Committee on Employment of the Handicapped, which is a body that you will find in practically every state, as well as the Developmental Disabilities Council, which is a federally mandated body which advocates on behalf of persons with developmental disabilities.

We do caution, as an office in the governor's cabinet, or the lieutenant governor's. We [INAUDIBLE] cabinet meetings. It gives us an opportunity to find out what is going on in the other agencies and to constantly remind them of the needs of disabled individuals, because truly the impact on each and every agencies.

The Department of Public Safety has deaf inmates in our prisons, and we need to make sure that they are receiving interpreting services.

The Department of Transportation has to ensure that the Metro system is accessible to persons [INAUDIBLE].

Obviously, the Education Department has wide-ranging responsibilities.

So, I must say that Governor Shaeffer has been responsible for our office functioning at the cabinet level...

DR. DANEK: Do you know what other states--how many other states about have that office functioning at a cabinet level?

MS. JEFFERS: To my knowledge, there are none. However, in the state of Illinois, the Department of Rehabilitation Services, which is a direct service agency, vocational rehabilitation agencies that have that [INAUDIBLE].

DR. DANEK: Thanks.

MR. BIAGLOW: My question is, I'm trying to identify who in your state organization would a handicapped individual go to, say if he was a high school graduate, and about a 3, 3.5 average, can't afford to go to school, needs some funding, needs some money.

The handicapped need money [INAUDIBLE] special treatment activities in their schools.

Which organization--would he come to your organization and say, recommend how I can get a scholarship, or recommend a university?

What is the pipeline by which a handicapped individual must enter an educational system to get a science and engineering degree?

MS. JEFFERS: Certainly our office performs an informational referral function. So if that individual were to call us, we would do some legwork [INAUDIBLE] to identify the program for them.

We would also make an automatic referral to the Division of Vocational Rehabilitation to ensure that that individual is in that system to see if perhaps they might be able to help.

If the disabled individual were interested, let's say, in pursuing education at the Community College of Baltimore, we would then act as an advocate on their behalf if they felt that was necessary to explain to them the admission procedures, so on and so forth.

Our office facilitates services rather than delivering them, so we would be in a good position to do that. But there isn't a clearinghouse for disabled students to go through if they wish to pursue a college education in science and technology, that there isn't a funnel, if you will, for them.

But if they feel that they need some assistance, we will certainly try to provide them.

MR. BIAGLOW: All right, thank you.

DR. ADAMS: One final--you mentioned, you were talking about the research needs, data needs, and I was hoping that you were going to give us a little clearer statement. So we have a minute, if you could make a recommendation for some exactly what this Task Force should recommend in that regard, quickly, what would you do?

MS. JEFFERS: It would be to conduct a census of scientists who are disabled within our country for purposes of identifying that or in peer or mentor relationship with disabled students who would be interested in pursuing such a career, rather than to identify them as being different, and that certainly is a very sensitive issue.

But to provide that role model for disabled kids who would want to pursue that as a career.

DR. ADAMS: Thank you very much, doctor, for your testimony.

Next we have a panel of discussants on the handicapped. Dr. David Lunney from the Department of Chemistry, East Carolina University; Dr. John Gavin, Director of Science Policy, Engineering Economics Research, Germantown, Maryland; and Dr. Edward Keller, Professor of Biology, West Virginia University.

If those persons up here, would you please come to the--[pause]. As they are approaching the table, we do have a letter here, a request from Congresswoman Bentley. We already acknowledged that she would [INAUDIBLE], but because this is a congressionally appointed committee, we wanted to make sure that we let them know that she did write us a note and she thanked us for the opportunity to speak to the committee.

She is very interested in our results, feels that this will be [INAUDIBLE] information for the U.S. Congress as they go forward looking at the year 2000 and how they might approach the whole problem of minorities, women and the handicapped in science and technology, specifically with regards to the changing demographics that are taking place in the country.

So we want to acknowledge that letter. She wishes us well.

We will say welcome to this group. One of the real concerns that we have and we have been trying to make sure we have a very good handle on this. We have not talked a whole lot about the disabled and their participation in science and technology, and we welcome you all to us today and we are looking forward to your testimony and you can help us to shape policy decisions that will be going forth from the Task Force. Welcome.

DR. LUNNEY: I guess that I am up first. I'm James Lunney. I'm Professor of Chemistry at East Carolina University.

?: Use the microphone [INAUDIBLE].

DR. LUNNEY: I'm Professor of Chemistry at East Carolina University and [INAUDIBLE].

I am also half-time Director of the Science Institute for the Disabled, which was formed in 1976 to improve access to careers in science and technology for the disabled.

I got into the area of science and technology for disabled people quite by accident. A very persistent blind student signed up for freshman chemistry and insisted on taking the laboratory.

And one of my colleagues, Bob Morrison, volunteered to teach him. [Pause--side conversations] One of my colleagues volunteered to teach the student, knowing that it would take a lot of extra time.

And the usual [INAUDIBLE] a visually impaired student goes through a science laboratory with a sighted assistant, and unfortunately the assistants very often are too helpful. That is, rather than merely delivering the readings unvarnished to this blind student, they add their own interpretations, which is not what we're supposed to do.

And the student was really looking for more independence than that, and he kept saying, isn't there a better way?

It turns out there wasn't. There were very few adaptations for visually impaired students suitable for use at the college level. There are some stuff available that looked like it came out of a chemistry set.

So we decided that the way to handle the problem was to use the best available technology. The upshot of this was that we got several grants from special education programs and public education to develop a powerful data acquisition computer with [INAUDIBLE].

We then developed a production-ready prototype of that machine. There are two copies in existence [INAUDIBLE] our laboratory.

It is an industrial-strength data-acquisition system that can measure any sort of instrument essentially you might encounter in a college science laboratory and present the results as speech or as auditory pitches to the user.

Other things include turning chemical data, or other scientific data in auditronic [INAUDIBLE]. I have a few tapes for you, have a cassette for you.

We have also added speech input to one of our systems, so that a person with upper-limb disabilities can control experiments [INAUDIBLE] and perform computations using voice commands.

Unfortunately all of this stuff sat in the laboratory and collects dust because we haven't yet succeeded in finding a manufacturer to build our data acquisition sytem. We designed it around industrial substances so it could be assembled almost like a serial system. [INAUDIBLE] and then you've got your system.

Unfortunately, the system costs about $8,000 and the likelihood of getting it adopted in other institutions is regretably very small.

And so we decided that if we can't get this nifty machine to other universities, we were going to [INAUDIBLE] to us, and that is why we founded the Science Institute for the Disabled at East Carolina.

It may sound impressive, but it consists of me, the graduate system, and an advisory committee right now.

Our first [INAUDIBLE] is going to be summer research programs for disabled students, this summer. [INAUDIBLE] 10 very bright, very determined, very persistent disabled students coming in with a mix of disabilities. We have three blind, four with cerebral palsy, I believe.

Some of them are quite severely handicapped, but inside those disabled bodies are very bright minds. And I think these kids will be very good scientists when we finally get through all the training.

All that I know anything about is high-tech adaptations in the laboratory, and in that area funding has been dismal. The fact that we were generously funded from about 1980 to 1985, but the Department of Education is [INAUDIBLE].

We have not succeeded in connecting with any significant funding in the past four years, and most of our proposals to the Department of Education [INAUDIBLE].

So when it comes to recommendations, the only recommendation that I really have is that for disabled people to approach productively in science they need the best that technology can offer, not top technology, not toy computers, but the best available technology, and there must be some means of funding for development of that technology.

And that's all I have. [BELL]

DR. ADAMS: All right, we'll hold questions until we hear from the other panelists. I'm sure we are going to have some questions we would like to ask you. We'll go to the next presenter. Dr. Gavin.

DR. GAVIN: OK, well, this morning, there's a very lot going on. You might think I'm handicapped. I don't believe it. [INAUDIBLE] Some think I do pretty good, and some think I can't do at all, and [INAUDIBLE] [laughter].

Now what I can do and what I do pretty well, [INAUDIBLE] and why not. [INAUDIBLE] scientists and to be an engineer, physical capabilities don't happen to be among them. You need [INAUDIBLE] intelligence, problem-solving, curiosity about natural phenomena, and a desire to learn more about the environment.

So then you don't need capability, you [INAUDIBLE] survey, 2.2 percent of the scientists, that 92,000 [INAUDIBLE] as being physically handicapped.

[INAUDIBLE] indicate that they should be able to give them an opportunity to function satisfactorily as both scientists and engineers, and to [INAUDIBLE] John [Hawkins?] [INAUDIBLE] wanted to know [INAUDIBLE] in chemistry a couple years ago [INAUDIBLE] businesses and he holds a high degree

[INAUDIBLE] physics, and was the first one to calculate black holes.

So some of them do pretty good. He has Lou Gehrig's disease, and sometimes he needs an interpreter for when he speaks, because we cannot understand him, but that doesn't have much to do with what goes on up here.

Now [INAUDIBLE] would be more important than the way the person is packaged, but that doesn't seem to come out very well. If we look at the package [INAUDIBLE] and all these things don't seem to count with scientists [INAUDIBLE], don't have any trouble with the package [INAUDIBLE] being female and black, they move up [INAUDIBLE], package, that doesn't really mean very much, except that they get excluded from the things that are going on, and sometimes the [INAUDIBLE], many times, despite the quality of [INAUDIBLE].

OK, how do the variety of conditions that are available to a professional scientist, and many people are working on the [INAUDIBLE], professor of zoology at the University of Maryland has been blind since the age of three. So I think he would be [INAUDIBLE].

Educator possibilities [INAUDIBLE], the scientist administrator [INAUDIBLE], quadriplegic who [INAUDIBLE] science information center for NOOA. The scientist has a business [INAUDIBLE], about a week ago, when I met the first scientist businessman. I could talk to an entrepreneur. It is the first time I went to a meeting that I didn't use a scientist--it was a high-tech meeting for Montgomery County, and [INAUDIBLE] somebody asked, why don't I use an interpreter? That is the first meeting that I have been to [INAUDIBLE], had nothing to do with the handicap [INAUDIBLE] interpreter. It turns out he is the president of a company [INAUDIBLE] microcomputers in the high-technology part of Montgomery County.

[INAUDIBLE] he was President of the American Society for Microbiology and he was also President of the American Academy of Microbiology. He is a Professor in microbiology at Baylor University College of Medicine.

[INAUDIBLE] international, so I guess he was born deaf and he had a [INAUDIBLE] degree from Princeton and a Ph.D. from [INAUDIBLE] University and he is an internationally known scientist, in fact, [INAUDIBLE] biology.

They use the vascular [INAUDIBLE] system when they do transplants. [INAUDIBLE] rehabilitation medicine.

But first of all, young disabled people ought to be told that science can be a viable career, and [INAUDIBLE], and so that many people who might do well in science and have it as a career never find a way to get into it because they don't understand and nobody bothered to tell them that.

[INAUDIBLE] I think it's nice if you have a [INAUDIBLE] to accommodate your specific disability, see if we can't have people like at the University of Minnesota, they just spent six million bucks on a new chemistry building. [INAUDIBLE] and professor [INAUDIBLE] don't think they should have handicapped people in the lab.

[INAUDIBLE] sensitivies--handicapped people, and they don't belong in science, and if [INAUDIBLE], then we need two people to do one job, and things like that.

And then we have those who are [BELL] [INAUDIBLE], they get all upset, they don't know how to handle you [INAUDIBLE], when you're earning a living, then you have to act sort of arrogant--you can't do that, the only thing that [INAUDIBLE]in a wheelchair or whatever. They told me that when I first tried to get a Ph.D. They said you can't get a Ph.D. [INAUDIBLE] Well, we've managed that.

Then I said I would like to teach, and they said you can't teach if you're [INAUDIBLE]. But I learned to get on to [INAUDIBLE], so I asked the people at the University of Notre Dame, [INAUDIBLE] that organization, [INAUDIBLE] technology program, and there they gave you full [INAUDIBLE].

[INAUDIBLE], that's not really important. Do it and get ahead. There's many jobs [INAUDIBLE] for the handicapped. We cannot confuse entry-level jobs, trying to get a promotion [INAUDIBLE].

[INAUDIBLE] Or they find out I'm [INAUDIBLE] or, well, we'd hire you, but we don't have a job opening now, but why not [INAUDIBLE]. We just have somebody around here who [INAUDIBLE].

I think the recommendation [INAUDIBLE] handicapped, the minority [INAUDIBLE] because when you see those programs, we always wind up at the bottom [INAUDIBLE], the National Science Foundation are going to give a few more scholarships for women and minorities, but the handicapped weren't included, so I guess we're not going to get any of those [INAUDIBLE].

[INAUDIBLE] we might not have free speech, but we do know what it's all about, and some of the prestigious ones don't even show up at the meetings.

Our third--the National Science Foundation [INAUDIBLE] science program for disabled children at the elementary, middle and the high school level [INAUDIBLE] stimulate their interest, and this is where they should come in, and we should reach them in a way that they can learn that they may all be in a satisfactory career with a lot of good options if they become scientists or engineers.

Then [INAUDIBLE] that certain individuals to be available to undergraduates [INAUDIBLE] disabled graduate students and can be available from both the NSF and the NIH.

[INAUDIBLE] organization because then when you show up they can't turn you down, because they say, well, [INAUDIBLE].

Thank you all for listening.

DR. ADAMS: Thank you very much, Dr. Gavin. Dr. Keller.

DR. KELLER: I'm new to talking as a professor. I usually can do the [INAUDIBLE] [laughter]

I also had a little trouble because I tend to think after 27 years of teaching, that everything comes in 50 minutes [INAUDIBLE] [laughter]

This testimony concerns the aspects of interest in education which can ultimately result in the scientists who happen to be disabled.

The present and the predicted shortfall of the scientists, engineers, and science educators means our society must encourage disabled youth of the nation to develop and implement mitigative strategies and include disabled individuals in the pipestream.

Although my major recent experiences with disabled youth has been experiential in nature, running summer programs for disabled students in marine science, I have been disabled most of my life and then relate to those integrative strategies that work, those which don't work, and the background information that one really should have to get [INAUDIBLE].

First the experiential education, I had eight SSTP programs from the National Science Foundation. It's a Student Science Training Program.

And these targeted the 12th grade students, and the first three we had, we ran at West Virginia University, and we didn't have any disabled individuals. However, we didn't exclude them, it's just that none of them applied. And I thought, wow, why didn't this happen?

So I said, we ought to have one just for disabled. So NSF funded for five years, until someone shut down the education unit at NSF, we were doing very well.

We had 117 students who completed the five programs, and most of them completed with a few dropouts here and there, mostly homesickness, which is one thing we couldn't cure in a week or so.

There are five items of information that we gathered that I would like to share with you, and the first was that when most of the students entered the program, they had not targeted a career or they had targeted a non-science career.

We didn't make that as one of our criteria, that they were interested in science.

In the follow-up survey, 78 percent of the students were either science college programs or they were in science careers at the entry level.

The second point is information from the exit interview survey which showed the most valuable experience the students had was the precollege experience. They appreciated that interaction that they received with the college professors that were teaching the program and with the information they gave them about college, and they were much more comfortable about going to college at that point.

This was a surprise. We hadn't expected that, but it was unanimous, every one of them had that on their exit interview.

Thirdly, the average-wide over the first four years--our program ran all types of disabilities, and did academic as well as social as well as experiential kind of things, and the highest ranking students were those which were partially sighted.

The totally blind students ran second, orthopedic motor impaired students ran third, partially hearing ranked fourth, and profoundly deaf students ran fifth.

The fourth point in our program was that there was an enormous amount of positive social and academic interaction and assistance which occurred among students of various types of disabilities.

They had these unexpected experiences of learning how other disabled individuals adapted, how they got around, and how they could assist each other.

We had found out after we were funded, the first time experts told us you can't do that program, you are going to run into many problems. We ran into a lot of problems, but they weren't with the kids, they were with what we were doing.

Finally, the director and staff learned many lessons and strategies on science teaching of disabled students, and as a result we gathered together a writing group, and with another NSF grant on training teachers for the disabled, we produced a resource book, of which I have a copy here, we will leave with you for your perusal, showing that where we were about four or five years ago--of course, needs updating now and [INAUDIBLE].

I brought also a captioned film which was produced by NOAA and this is about our program.

So when I am always preaching, well, it's better to do than to sit and talk about it, you can see what they were doing in the program, so we [INAUDIBLE] as well.

The second submission concerns a partial inventory of ideas and the needs of disabled students mainly and the experiences over our five years of training them, and with the experiences of writing, of our writing group as well as the individual literature sources and by patience.

Most of what I'm going to just miss through here briefly comes from Culcane and Motherwright [PHONETIC], 1979. Specifically, it came with being the very needy kinds of activities and experiences for young disabled individuals.

First, people who understand the meaning of a specific disability. That sounds sort of like a platitude, but it struck home to me when in our second or third year of the program, one of the deaf students and I had a conflict about what he was doing and he got furious to me and signed to me, which I didn't fully understand, which was probably a good idea, that you really don't know what's going off, you're not deaf.

And I pondered that and talked about it with my colleages at Gallaudet University, and they said, well, he's right in a way. You really can't deal with that kind of thing.

And I said, well, probably it's true for all of the disabled. And it turns out that after talking with other friends and other individuals that this is true.

The opportunities to communicate much of my write-up that I am going to leave with you deals with this kind of problem and I am not going to elaborate on it here.

Access to information. Students have difficulty accessing information at their level, at their reading level, in their mode, their optimal mode of reading, of braille or tape, or tape receipt or things of that nature.

And what I just mentioned, some of the things about experiential learning, these students, these individuals, these disabled individuals, young youth are deficient in the experiential learning that normal--I used that word and I shouldn't have--non-disabled individuals have and get as part of their life, along with one of the other things they get, which is incidental learning.

They learn these things incidentally and can build on them. The example comes to mind here is kids when they are playing with the hose in the yard and they spray each other while grabbing the hose.

And that analogy is very useful when you are talking about blood pressure and circulatory problems--I'm a biologist professor, so I relate it there--and they can see that pressure change. But a lot of kids, quadriplegic, who have never had that experience.

And they are deficient in these given areas, so.

Then the other one which we all need, but especially we need to be careful to get it into the youth, disabled youth, is the opportunity for self esteem.

A lot of times we are down and out and, you know, we feel badly, but those kids get hit with it all the time. I really didn't appreciate this mainly, until I went through a course, and then I really appreciated what that [INAUDIBLE], God, you know, it must be really bad younger getting hit with these kind of things.

But anyway, I have overlapped with Dr. Gavin's 100 role models. As a matter of fact, I have a copy of a book I'm going to leave you on role models, currently living role models, able scientists, disabled persons, and I am leaving that with you as well. That is published by the Foundation for Science and the Handicapped, of which Dr. Gavin was one of the founders and, of course, the first president.

I'll just put a little plug in John, I'm the president-elect of that.

So anyhow, we have been doing some of the items.

Multi-level learning experiences. A lot of times the disabled youth learn at the concrete level. They learn at the knowledge base and they don't get real opportunities to integrate these things.

But to develop an analysis, to do the analogies that are required, and this takes some kind of a special effort to do this, and we had considerable difficulty with this aspect of our programs in marine science.

Opportunities for academic success. You have got to program things so that, you know, you make it a little simple to begin with, and let them learn and then build on it, just like with the other kids, but you have got to be a little more careful to make sure that they experience this.

The opportunities for success. The social functioning in the classroom and other structural situations. Well, we all need that, but we've got to make sure that when we have a group of disabled individuals together or there is a mainstream aspect of--which I like a lot--these things have to be highly interactive in nature and the teacher or whoever is in charge of that activity must pay considerable attention.

Dr. Gavin talked about the last thing I have there--recognition of individuals who just happen to have a disability.

So that is what those of us who are disabled are looking for, and I think probably you will find that that is [BELL] a universal kind of thing.

Darn it. I can hear that, John.

My recommendations actually are--I'm just going to read through the major titles. I ran out of time because it is a bad two weeks for us at West Virginia University. We are in finals week and--well, I can tell you more about that--but anyway, so I had to type some of this myself, and I just didn't type fast enough, so I left a lot at home.

So I'm giving you this third section which is a presentation of a series of activities which I want to recommend. I will just list through the kinds of things and there are samples, because the list is almost endless.

Science teachers preparation and beyond.

The development of systematic methodology for offering experiential activities to disabled youth, something [INAUDIBLE] did.

Expand public awareness of disabled scientists and science students, study [INAUDIBLE]. Just a little aside there, I did talk with Mrs. Don Herbert, who some people refer to as Mrs. Wizards, but she is the one that is in charge of the program for the Mr. Wizard series, and I just mentioned, why don't you have any disabled students on there. Well, we program in Calgary. I said what's that got to do with it? They have disabled kids in Calgary.

And so she said, they really hadn't thought about that a lot. So she asked me to send her some information. So, I don't know. We might have a little--but that's the kind of just aside that one could do. There's some other recommendations.

Standardize the sub-grades underrepresented in science. You did it [INAUDIBLE] but a lot of people from the women, minorities, and handicapped, or disabled.

I went to an NSF meeting two weeks ago. The main speaker there was talking about things. We have two special concerns, women and minorities. And I was waiting for the third one, it didn't come.

So I said I'll have to talk to him later.

Anyway, then we went to the program, and said, well, here, we'll break up into little groups, and these groups are for biologists, and for this and this and for that. And there is one for women and minorities.

And I said, there are two disabled groups there, what are we going to do? Oh, well, you go in with them. I said, well, don't we count to begin with?

Then we came to the final clincher--NSF has been charged with evaluation of SEE, and he said, here it is the evaluation point, we're going to start gathering data. Now we need all this data, all these data, and we have got to gather it sequentially and appropriately.

And I looked over the questionnaire, nothing about disabled. And I said, well, aren't you going to find out what--you mean it's missing? I said, yeah. [INAUDIBLE] Oh, we'll do it next year.

And I said, I hope so. Anyway, the removal [INAUDIBLE] for the disabled student at the graduate level. Two [INAUDIBLE] universities were certainly here, and we found out that 14 percent of the graduate faculty said, absolutely, no, they would not accept a disabled graduate student under any circumstances, and only 21 percent would accept a qualified disabled graduate student without conditions. The others had conditions.

Requiring funding agencies to have a disabled coordinator for science. NSF [INAUDIBLE] has two of the three groups covered. They have women and minority coordinators and people to look after things, but nobody from the disabled.

Well, I'll leave you to read the rest of the submission, if you will. Thank you.

DR. ADAMS: Thank you, thank the three of you for your testimony before this committee. There are some very salient points there. We, as I said before, are very anxious to look at ways in which we can get into this report, so that at least by mandate we respond to the kinds of things that you are talking about. So your testimony will serve us very well.

Let me turn to the committee and--Dr. Danek?

DR. DANEK: Yeah, we have a gag rule here where no committee member will discuss or argue with a testifier, and I won't violate that...

?: What happens?

DR. DANEK: But I do think there are some things about NSF that I would like to talk to you about [INAUDIBLE] correct what problems do exist at the agency. And I would be glad to talk to you about those and pursue some of the things that you have mentioned.

DR. KELLER: There are a few of those pointed out.

DR. DANEK: Sure.

MS. MEJIA-WALGREEN: I have--yes, oh, OK. Mine isn't a question. Mine is a comment and it is for Dr. Keller. I hope that our Task Force will use a phrase that you used because it made a tremendous impression on me.

It goes right back to what Dr. Gavin was saying and to our first speaker, Dr. Lunney, was saying.

You said, we ran into a lot of problems, but the problems were not with the kids. It was with what we were doing. You talked about expectations, you talk about attitude. That phrase of yours catches a lot. I thank you.

MS. SMITH: I have a question regarding teacher preparation.

DR. ADAMS: Just wait a minute. Dr. Gavin.

DR. GAVIN: May I just make a comment. I don't want to [INAUDIBLE] kids. If they don't get the opportunity to fail, [INAUDIBLE], the same thing as anybody else. They can't learn from their failure if they don't [INAUDIBLE]. We learned, we failed, we changed, we changed, and then you get people who don't get that opportunity.

So the first thing you have to make them do, is they can do what they want, and if they fail, they learn, and if they don't fail along the way [INAUDIBLE].

MS. SMITH: I have a question for any or all of you [INAUDIBLE] people in teach in your [INAUDIBLE] or a preparation of teachers who are going to teach even regular science courses. Is there anyone that has a section or component that would sensitize science teachers to those with disabilities?

DR. KELLER: One of my recommendations is to work with these curriculum revisions, people who are working on teacher prep now, and one of them is called the Home Consortium of 150 or so research universities, and to develop things like getting into [INAUDIBLE] courses in science, how to handle and deal with and innovate the kinds of thing [INAUDIBLE]

DR. LUNNEY: May I respond to that also. East Carolina has pretty good programs in the Science Education Department. We have the only graduate course in science education for disabled students in the state of North Carolina, and we periodically offer workshops, summer workshops in science for disabled students.

We plan to do more of that once we get funded from NSF [laughter].

DR. MALCOM: Since we are all claiming that John did something for us [INAUDIBLE] in our lives, I must tell you here publicly that John Gavin is the impetus for the creation of the Project on Science, Technology and Disability in the Office of Opportunities in Science at AAAS.

And that project, which has really become a resource in this country that people try to deal with these issues, would not be there if it were not for John Gavin. And I just want to note that publicly and for the record.

There are a couple of other points that I think that really do need to be picked up on. One is this whole question of science teacher preparation.

In a recent study that, survey of people, national survey that was done by [INAUDIBLE] that people that teach science and mathematics in the United States, there is a question that is included about the comfort levels of the teachers in terms of dealing with students in [INAUDIBLE] setting that they were disabled and should work a lot in different ways.

You talk about learning disabilities, mental retardation, and physical disability. They have very, very low levels of comfort on the part of the teachers. Probably the highest comfort levels are among the elementary teachers, interestingly enough, and as you go up your grades, your comfort level actually decreases.

And I think that the whole issue of including within the expectations for teachers being able to deal with students with disabilities in a mainstream setting, that that needs to be included as a matter of course in the same way that you would say that we have to expect that all teachers are given the skills to deal equitably with all students, as individuals, and meeting their needs in science and mathematics.

The other thing, though, I think that is going to be a problem, and I want some input on how to deal with this, is that I think that there are faculty who are very well intentioned in college, who would like to be able to meet the needs of a disabled student who shows up in their classroom, but they don't necessarily know what to do.

Yes, you know, you and I can say that the easiest thing is probably to ask the student what kind of accommodation or what have you that they might need. But some people are not necessarily going to be comfortable as a first step in terms of doing that.

Where can we--what can we do about providing technical assistance to faculty in colleges and universities, about how you make those accommodation?

I mean I ran into that in a real personal experience where my husband now has right now a deaf student in his class. And about the whole question of just how you solve the most fundamental kinds of issues.

Yes, I was good as a resource to help him, but where is the resource when that other faculty member, who wants to help in terms of making that accommodation, just a simple thing of if you're giving out the notes, give them out ahead of time so that if [INAUDIBLE] misses some terms, that there can be a possibility of filling those gaps, you know, those kinds of things.

But I think that we have to really face up to this technical assistance issue within our colleges and universities.

DR. GAVIN: [INAUDIBLE] glad to have Shirley Malcom.

DR. KELLER: I have talked [INAUDIBLE] about updating our resources of the book that we do use now, which is out of date, according to when you're publishing, now out of date. But also to use the electronic media in the network that we do have, and to not only put things on hard copy form but also to transmit that in floppy disk.

But the information is out there. It's not going to, it's not that updating has not been included in an appropriate form, but the information is available. I think that when we get these networks that are just in their rudimentary phases now. The scientific association--I saw some at NSTA meetings that they got this network up and running, but I think that without the people in the station, they don't know about it yet.

DR. ADAMS: Very last comment.

MS. SMITH: I have just one more question that I would like to pose, and that is, a great deal of my work has been involved with working with families of people who happen to have a disabled family member.

And I'm wondering, in the work that you gentlemen have done, the outreach obviously that you have conducted in certain areas, has there been any targeted program that has been done to get more information to major organizations that reach families of those who have disabilities?

DR. KELLER: Our surveys for our experiential programs on our exit surveys show that the most influential and help in decision making with the science teacher overwhelmingly, by about 75 percent, [INAUDIBLE] parent organizations and radio stations and all kind of media, and it was still if the science teacher thought it was a good idea for that kid to do something, the parents looked and the kid.

DR. ADAMS: We would like to thank the panel for your participation. Thank you for your written testimony that we will use to finalize our report, and we might need to come back to you because this is one of the areas that I have said again we want to make sure that we do a good job of trying to say to those persons who have asked us to put forth the final report that you are well represented in that.

Thank you very much for coming.

We now are going to go to the [INAUDIBLE]. We have five persons who will be [INAUDIBLE] at this time. I would like to ask all of those persons to come down to the front--WEssels, Habarth, Thompson, Teplitz, and Carruthers--and we will go in the order starting with as they come, Jo ~~E~~Wssels will be the first, Ted Habarth will be the second, Ms. Thompson--Dr. Thompson will be the third, Teplitz will be the fourth, and Carruthers.

We will have three minutes of testimony and we will have three minutes for question and answer. We are right on schedule at this time. We would like to thank our first presenter, Ms. WEssels, because she allowed--she gave her 10 minutes so that we could fit the whole day in. We really appreciate that. She comes down from the Jefferson County Public Schools in Colorado, and she is going to talk about the affect of AV materials on encouraging girls to pursue scientific and technical careers.

Thank you very much.

DR.WESSELS: Thank you very much. It is Dr. Jo WEssels, and the reason why I mention that is that what we are talking about today to the Committee [INAUDIBLE] I did my doctoral dissertation on math fear.

In addition to the county schools, I have been [INAUDIBLE] teach middle school during the day, so I am right in the trenches working with girls [INAUDIBLE] coordinating an advisement paper that we will be using next year.

[INAUDIBLE] presentations for the math teacher showing [INAUDIBLE] for the purpose of encouraging girls to pursue scientific technical careers. All of the presentations that are currently available feature female role models presenting factual information about their careers.

Research, however, shows that factual information on careers is not enough to encourage girls to consider scientific technical careers. [INAUDIBLE] I'll use as highlights, life styles.

[INAUDIBLE] I created two presentations [INAUDIBLE] different scientific technical careers. They differed in that one [INAUDIBLE] only factual information about the women in their careers and was typical of ones that are currently available to educators on a nationwide basis right now.

The other presentation not only included factual information about the careers, but it reflected upon their life styles.

I created this in cooperation with the National Bureau of Standards in Boulder, Colorado, and actually--there are two copies of my dissertation here. They are available for use by educators and professionals through, call our CARE Center--Career Awareness and Resource Education office--for the Bureau of Standards.

All students are administered a pretest, one of the two presentations and then had a post-test. But the primary research hypothesis will be [INAUDIBLE] including life styles and encouraging the girls into these technical careers.

And that's exactly what we've. After viewing the life-styles presentation, this is the one that [INAUDIBLE] showed the women in their careers. Girls tended to feel more strongly that women employed in scientific technical careers would probably not have a goal in life outside their work hours, but if they had interest in outside recreational activities [INAUDIBLE].

Even more [INAUDIBLE] than this is the fact that the presentation that just showed a woman in a career [INAUDIBLE] a chemical engineer, an electrical engineer, presentations that simply displayed the information to them on women in their careers actually would discourage them to girls at the time they were created to encourage them.

In particular, several that [INAUDIBLE], that the factual presentations stem from several negative stereotype images of women.

Students who saw the factual only presentation, were more likely to agree that women getting [INAUDIBLE] were employed in scientific technical careers.

The girls who saw the factual only presentation were also more likely to feel that women who were in these careers would probably have a boring life outside there, that they don't have interesting outside recreational activities and hobbies and that do not have much family and home life.

This research also applied to [INAUDIBLE] career, but it's much worse [INAUDIBLE] in the key years of seventh through ninth grade when it is very important to [INAUDIBLE].

The presentation that included the life style format versus the one that showed the women in the career only was also much more openly accepted by the girls and made them realize that they could maintain their femininity and [INAUDIBLE] in these careers.

[INAUDIBLE] any specific recommendations, it would be for more research into these presentations. Teachers right now are using these presentations en masse within the public school system, and if we go through and [INAUDIBLE] these women as [BELL] role models, which is one [INAUDIBLE] key entrance to the girls in seventh through ninth grade that these recommendations should be kept in the class.

The use of [INAUDIBLE] presentations by the government in educational [INAUDIBLE] to convey information about careers is growing.

Simply conveying the career information through these presentations is not always as effective [INAUDIBLE] my dissertation has shown, it is actually discouraging and damaging to girls that were interested and had potential interest in these careers.

Research and study into the most effective use of these presentations will ensure [INAUDIBLE] potential.

DR. ADAMS: Comments? Questions? OK, thank you very much. Mr. Habarth. Ted Habarth is the [INAUDIBLE] at Hopkins. He is currently working on a project called Journey into Science and Engineering, and he will talk to us about that project.

MR. HABARTH: Thank you, Mr. Chairman, members of the Committee. Let me say just first here that the things that the things [INAUDIBLE] list that Dr. Gavin put up earlier [INAUDIBLE] we need to look at that as applicable to our younger people as well as the handicapped.

I would like a copy of that if I could get a copy.

During the course of these hearings throughout the country this Task Force will hear, be presented with, and gather all the necessary statistics relevant to the fact of involving greater numbers of American women, minorities, and handicapped in the international war for world leadership in science and technology in the 21st century.

I was [INAUDIBLE] a few comments before this Task Force in describing one concrete effort under way, which is designed to impact the common notion among too many of our young people today that science and technology is not for me.

But first let me set the context of my testimony. The lead story in this week's issue of Time, and I hope every member of this Task Force present takes the time to read this startling but [INAUDIBLE] snapshot of teen life in our cities.

It is entitled "Kids Who Sell Crack." I want to read just one brief paragraph from this article, quote:

"School officials say they are suffering from a glut, not a lack of educational programs [INAUDIBLE]. We've got [INAUDIBLE] foundations with charity organizations working with us. Everybody is just pounding the kids all day long. Yet the older drug dealers are winning the war for the hearts and minds of our children.

"When impoverished youngsters see hundred dollar bills waving under their noses, it is hard for them to turn away. Says Dr. Robert Nolan, Director of the Drug and Alcohol Abuse Services at New York Hospital, 'Just saying "no" doesn't help. The poor ask, "What can we say 'yes' to?"'"

Journey is [INAUDIBLE] series of videotapes for use in schools. The first two of which have been recorded and will be tested in selected schools this summer.

The series is designed to impact teenagers by allowing them to meet people like themselves in science and engineering and technology, medical and other professions.

It will allow them to have--it will show them how others like them can and have said "yes" to choices leading to such career options.

Journey [INAUDIBLE] multiethnic and multiracial viewers to take control of their future for the use of students involving celebrity interviews.

Each episode uses a mixture of documentary, magazine, and music type formats to take viewers on a journey through the lives of individual guests.

The effects of those avenues which people take from their teenage years to actual professions, demystifying the process teenagers find so confusing and possible [INAUDIBLE].

Science and engineering professionals, athletes, musicians, corporate executives, graduate students and even high school students, for example, discuss decisions they have made to achieve their goals, while sharing concerns, while sharing concerns, feelings, and motivating factors [BELL] experienced in their lives.

[INAUDIBLE] in each episode of Journey in the in-school series, consisting of a teacher's guide, a student workbook, and informational material for parents that we develop a leading experts in secondary education guidance program at the Johns' Hopkins University Division of Education.

Diagnostic evaluation, the impact of Journey on the students on a short-term and long-term basis will be carried out by the School of Education at the University of Michigan.

This involvement of two major research universities in the Journey project has already attracted the attention of school administrators and teachers in various parts of the country.

While Journey's impact is directed at all teenagers, the [INAUDIBLE] of the project ensures a special sensitivity to the needs of minority students.

This nexus also provides the series with a pool of effective stories of minority scientists and engineers who have successfully progressed in the educational pipeline to and through graduate programs, from backgrounds and communities, and communities not unlike those [INAUDIBLE] teenage years.

More than 8,000 teenagers around this country have watched the pilot of the Journey program for the past two years. More than three-fourths have been black, Mexican-American, Puerto Rican, and American Indian.

There is some positive reaction that underscores the extent to which the messages of this series hits home with teenagers around the country.

In addition, the second Journey series of programs is being planned for commercial [INAUDIBLE] and broadcast.

This effort funded and implemented independent of the in-school series will [INAUDIBLE] consisting primarily of music, entertainment, and celebrity interviews.

However, these shows will reiterate and reinforce the themes developed throughout the in-school series, and thus serve to promote and popularize the use of Journey in the classroom.

A commercial test broadcast of this version of Journey is being scheduled for this fall in Houston [BELL], Los Angeles, and New York.

One last comment. This collaborative effort of Journey, the Johns Hopkins University, and the University of Michigan recognizes that we can no longer rely on effective programs reaching groups of 30 or 40 students in school populations ranging from 1,000 to 9,000 students in high schools in New York.

In our age of mass communication, this country's science and technology interests must begin to look at methodologies long proven effective with their young people for the sale of cosmetics, clothing, automobiles, jewelry, beverages, record albums, and compact disks.

We must get out there across the country in cities large and small to give our young people something else to [INAUDIBLE].

DR. ADAMS: Thank you, Mr. Habarth. You do have?

MR. HABARTH: I have copies for every member of the Committee.

DR. ADAMS: Dr. Anne Thompson from the American Geophysical Union, Washington, DC. Dr. Thompson.

DR. THOMPSON: Thank you. The American Geophysical Union is a society of informed scientific professionals in fields of earth and space science.

We come from a diversity of traditional backgrounds, including chemistry, mathematics, engineering, and [INAUDIBLE]. We probably have a broader discipline background than most of the educational scientific research organizations that you might hear from.

I am a member of a committee on education and human resources of the AGU, which means that we are people who are interested in education, education at the precollege level as well as your concern in early childhood education, getting more people into science.

And at a higher level, in recruiting talent into our own area of geophysics, which is, interestingly enough, one of the growing and well-funded scientific areas today.

We are also concerned with human resources in the sense that we look after the professional welfare and development of our membership with respect to funding and employment.

The concerns of your committee were relayed to our committee on education and human resources. I have prepared some general comments as testimony here, some specific recommendations with respect to your concern on education.

Ours are really at the higher end of the spectrum, but we are also concerned about the young people in crisis, and also made some recommendations on the role of the handicapped.

One of the [INAUDIBLE] this morning already that there has to be separate and exclusive funding. We're looking at the graduate level, and it really does have to be--there does have to be separate funding and definite funding for people who continue to get the higher education most of our members have.

But in the letter that Dr. [INAUDIBLE] sent to us she asked us to comment particularly on issues pertaining to women and research, asked us to research [INAUDIBLE] participation in the grant review and selection process, impediments to advancement, federal programs and so on.

And I only have a couple minutes, so I'm going to mention four areas of concern for impediments that remain in career advancement. We see this from the perspective that all of us on the committee--there are seven of us, three of us are women--all of us are actively engaged in research careers in the federal government, in universities, in the private sector.

We are familiar with the funding process, with the requirements to obtain a promotion in our various environments.

I will make a quick distinction between internal and external causes. I think we probably use "internal" in terms of cultural reasons, situational reasons why there are impediments.

And "external" would be sort of the system causes.

The issue of impediments to advancement, to learning might be the most challenging of all the concerns of your Task Force.

We suspect that once we've solved the problem of recruitment and getting people educated, once they are into the work force, they see a different set of problems that's very complex.

And we see this, as I mentioned from the research, at the highest end of the scale. There are many reasons for the growing lack of women in top levels [BELL] of science and technology in government after being in the private sector.

And I will just mention very quickly--I heard the bell--one is that federal government agencies in science and technology, or many of them, are top heavy in senior personnel. That hurts all young people and most women are younger people [INAUDIBLE].

The second has to do with the situation of the more or less permanent [INAUDIBLE] that go on in government agencies despite [INAUDIBLE] funding levels. Research is contracted out. Therefore, [INAUDIBLE] actually to minority and women-owned businesses.

But in the basic scientific research that we perform, being a contractor means doing a designed, specific task. And what results is advancement in remuneration and in management but not in actually defining and doing the science and [INAUDIBLE] career at the highest levels.

And the third concern that I'll mention is if some of these internal ones, how are people doing in education is very different from what they do in the day-to-day workplace. There is no [INAUDIBLE] problem, that the concerns that men and women bring to the workplace, their job expectations, are different.

We were lucky to admit it and I think that our recommendation to the committee is--admit it. And then have programs in which situations are acted out, role playing is done, so that women can see what they have to do to get more savvy to go after their own interests in promoting their careers, and then have to learn to relate to women on a day-to-day basis in the work area and not as mother and spouse.

So these are some of the concerns that we have that are among the complex issues at the high research end, and I am sure this afternoon you will be hearing more from other people. Thank you.

DR. ADAMS: Thank you. Again, your area, you're in one of those areas that we probably will--that's my area also. I'm interested in the advanced degree level [INAUDIBLE] engineers, and we want to make sure that the report does speak to that, because if we are looking towards having people available for research and development kinds of activities for advancement where people are going to become managers and that kind of thing, we've got to talk about that.

So specifically there are times when we miss unique kinds of opportunities--geophysics would be one of those [INAUDIBLE]. Thank you for coming.

Next is Dr. Jerry Teplitz from the Educational Kinesiology.

DR. TEPLITZ: Foundation.

DR. ADAMS: Foundation. We are [INAUDIBLE]. Thank you very much.

DR. TEPLITZ: Thank you, Mr. Chairman, members of the Committee. What I want to talk about is something called educational kinesiology, which you are probably looking at me and say, "What is that?"

What it is, is a way of determining what goes on in your body and in your mind. It is a way of taking children who are dyslexics, who can't add math because their brain, one hemisphere is not working properly, and not communicating with the other.

And they are going to take the notion of science and technology, and they are going to say, "No way." They can't add, they can't even focus in on that particular area.

Educational kinesiology is a way of very quickly overcoming those types of problems with children.

And what I want to do is actually a very short demonstration to intrigue the Committee to pursue looking at the materials that I brought more closely, because it is an area that probably you have never experienced before.

And I have a--Dr. Carruthers is going to testify next [INAUDIBLE]. I asked him to be a volunteer. He has no idea what I'm going to do now. This is not a setup.

Dr. Carruthers [INAUDIBLE] step in front of me. This is muscle to test some of the body. This is aimed to show how everything around us affects us, and the educational kinesiology uses movements of the body to realign hemispheres of the body to integrate the brain and the body and the mind all in the same direction.

But all you're going to do is stick your strongest arm out with your thumb turned down. I'm pressing down, you push up as hard as you can when I say resist. Ready, resist. [INAUDIBLE]?

OK, now, all we're going to do. I want to show you how you [INAUDIBLE]. You're going to put your arm in a [INAUDIBLE] again, close your eyes now. Think of the situation you've had as the student or the teacher that is negative to yourself.

Close your eyes. Shake your head when you have that thought focused in your mind. Got it, ready, resist. And for the record, his arm went down [INAUDIBLE] the first time it stayed up.

Now I want you to close your eyes and I want you to think of a school situation you've had that was very positive. Close your eyes and shake your head like that when you focus. Ready, resist. And his arm when I released actually went up towards the ceiling.

Thank you, Dr. Carruthers.

This is not a trick. This is not a game. My background is [INAUDIBLE]. [illegible] also have a doctoral degree in holistic health sciences. This is something that is very real that can have an impact on people in a very immediate way.

From an educational [INAUDIBLE] what we then do is find out what the body needs. And then by actually doing simple movements, we can take children who are in a sphere of being dysfunctional and haven't integrated one or the other.

Take them [INAUDIBLE] [BELL] and so that they can learn and function in ways that will allow them to make choices that they in the past would say, "I can't work with science, I can't work with technology, because I can't even add."

And put them in a [INAUDIBLE] where they can make those considerations for themselves.

And I have got material that you can look at on this whole area.

DR. ADAMS: Thank you very much [INAUDIBLE] so we'll have to go and come back to it.

Now, having undergone the demonstration, Dr. Carruthers, we welcome you to [INAUDIBLE] Dr. George R. Carruthers, a senior astrophysicist with the Naval Research Laboratory.

DR. CARRUTHERS: Yes, I would like to present the perspective of the Naval Research Laboratory EEO Office. The co-author of this testimony [INAUDIBLE] Executive EEO Officer at the Naval Research Lab.

At NRL we have a very successful community outreach program which promotes science and math at the elementary, junior high school, senior high school, and college levels.

Our employees participate on a volunteer basis, and many get so involved that they use their own time on weekends and after hours to carry out the [INAUDIBLE].

Now based on our own perception of the underrepresentation of minorities and women in scientific and technical fields, we at NRL believe that a federal program to promote the training of students in the fields of mathematics and science is just what we needed.

Local schools and communities do not have, themselves have the resources to carry on these programs effectively.

In recent years volunteer programs such as ours at NRL [INAUDIBLE] through adoption of schools, partnerships in education programs, tuturing, and so forth have been highly successful, but could be greatly enhanced by federal support and funding, either by a central federal office or a federally funded institute.

We would like to make the following specific recommendations in this regard.

First of all, grants should be made available through federal agencies, professional organizations, and volunteer organizations to support and enhance their present volunteer activities.

Next, curricula at elementary, junior high school, senior high school levels should include the teaching of mathematics and science on a daily basis because developing a good scientist is like developing a good musician or a linguist. Continuous practice makes a master.

The science and mathematics curriculum should include regularly scheduled lectures by outside professional scientists, engineers, and mathematicians.

Mathematics and science clubs should be promoted as supplements to regular coursework both during and after school hours.

[INAUDIBLE] type of contest should be promoted to enhance science and mathematics skills. The mathematics contests sponsored by the National [INAUDIBLE] Association are a good example of this.

Mathematics and science teachers at all levels should take part in an annual supplemental training to enhance and update their knowledge and to attain hands-on exposure to scientific and engineering activities in government and private industry.

We recommend the establishment of an institute to provide for such training, which would include both theory and practice.

Federal agencies and private industry are well suited to assist such an institute in accomplishing this objective. If funding were provided, these organizations will establish sabbaticals and part-time leave for their professionals to work with the institute.

Some of the programs already in existence could be expanded or enhanced. The Department of Professional Science and Engineering Apprentice Program, which now includes not only students, but teachers as well, is a good example of an excellent program.

This and similar programs could be enhanced by provision of regular lectures as well as work experience for teachers and students.

And we recommend that the granting of educational credits for participation in such programs be explored for both students and teachers.

To interest children in science and technology at the earliest possible age, we use a cartoon, in the form of comic books or children's TV [BELL] programs should be explored.

Parents should be encouraged to enhance their children's education by having them watch educational programs on television.

The wide availability of VCRs suggest that videotape libraries should be established and advertised. Educational videotapes can be used to enhance the learning of not only the students but their parents as well.

[INAUDIBLE] the word "people," especially in fictional science, fiction, or other programs needs to be addressed.

And finally, scientitifc and technical occupations should receive special emphasis during this and minority and women's awareness programs, Black history month, women's history month, and Hispanic heritage week.

As a final note, an assessment should be made of the existing volunteer programs that the [INAUDIBLE] coordinating these efforts and further developing and extending them in a most efficient manner.

And in all of our career awareness activities, it should be emphasized that mathematics, science, and computer literacy are not just for those who plan careers in a technical field. They are needed by everyone, including secretaries, machinists, welders, because technological advances affect all occupations.

Thank you.

DR. ADAMS: We have a few minutes remaining and I don't know that we might have, might not have some specific kinds of questions to ask the panelists, who are still assembled here. So we'll take a few minutes of time.

DR. CLIVE: I want to ask a question of our last presenter, Dr. Carruthers, because I was interested in your mentioning the spelling bee and now the math contests. I may be wrong but I think the national spelling bee is the only intellectual endeavor that ever makes it on television in the form of the nightly news, and the reason that it does, I think, is because you always have the scene at the end with this one cute little kid who can't spell antidisestablishmentarianism and there is another cute little kid who can, and there is a big round of applause.

I was just wondering, are these math contests of the same format? It seems to me that the kind of thing that would bring out the news media would be to see one kid who gives you the wrong answer to ab over x divided by c, and then you turn to the next kid and he does it right, and there is your winner.

What form do these contests take, and are they amenable to that kind of spelling bee format?

DR. CARRUTHERS: Well, they are not quite that real time. They are in the form of tests. So the test has to be graded in order to find out who the winner--who gets the first prize, who gets second prize.

DR. CLIVE: You just lost a shot on the evening news. [laughter]

DR. CARRUTHERS: Well, that's something worth looking into. We could make a real time math contest.

MS. BISHOP: Yeah, why not.

DR. ADAMS: Yeah, I think that that's--and that's been one of those things that--that did strike me as something that we ought to be able to do something with. So that is at least a unique idea whose time has come.

And, Alan, I can appreciate what you're saying. It has to be visual, and if it's on paper it might not do that. But with all the brain power we got, surely we ought to be able to come up with something along that line.

Are there other kinds of questions or comments because we do have a few minutes. Anybody else?

DR. MALCOM: I just wanted to note that if anyone happens to be going to Chicago this summer, that Dr. Carruthers is one of the people who was featured in this "Black Achievers in Science" exhibit at the Chicago Museum of Science and Industry, and I think that it is--that this kind of attention in our museums is something else that we need to do in terms of changing the image of science, scientists, and giving kids and their parents a different sense of who does science.

DR. ADAMS: All right, as we close out this morning, two statements, I guess, that we would like to at least leave you with. Some of you might not come back for the afternoon, we would hope you would.

One, I hope you get a sense of, we can get a lot of attention with these kinds of hearings. We have had a--just a wide range of testimony from various kinds of settings. We've encouraged that trying to come up with exactly the right way to package this so we can get it out.

But we don't want this to be just another report. You become an ally of ours. You have now been here, you know what we are attempting to do. We actually want to change the way in which we deliver education in this country.

And you can't do that without becoming an advocate for it. Almost all the things that I hear, you would think that education is less than desired.

When you talk about [INAUDIBLE]--women, minorities, and the handicapped, it definitely becomes less than desired. And it doesn't make a whole lot of difference about who is talking about it.

I have argued for a long time [INAUDIBLE] to my colleagues that I haven't seen many little kids who weren't excited about learning. I just haven't found any.

I haven't found little kids who just were not excited about learning. In some way in that whole system we turn their brains off.

I mean, when I taught biology, I would have kids come in my class and the first thing they would tell me is [INAUDIBLE], she had never done math and science.

And I said I don't want to talk about what she has done. We are going to talk about what you are going to start doing today, what [INAUDIBLE]. We are going to learn some science in this room. I am going to force something in her head, and I don't want you telling her she can't learn science anymore.

An amazing thing, because last night I had dinner with a young lady named Dr. Carmel Shaw [INAUDIBLE]. She is taking her final exams as a psychiatrist, studying here in this city, and she was a little plain, too-thick glasses, little girl in 10th grade who came to me, and they had told her she couldn't do science.

It was not acceptable to me. I think there is quite a lot of kids like that, and she learned mathematics, and said if I had not talked to you, I would have never taken any more science in my life.

And that's the state that we're in.

We need you, and we need you to become a part of this. First of all, we have got to become, we have got to be able to pay for it.

Now I like to say to people that, in my traveling I see signs that say "public boat ramps" and "public golf courses," and I don't hear anybody arguing about those.

And so, when I get a chance I say, I would like for some of my money to go for public education, and I am willing to stand up and say that [INAUDIBLE].

I think all of us have to take that on. And you can't run around on this. I mean you can talk about [INAUDIBLE] but until we educate the masses we are in trouble. That's just a fact.

So we would like to ask you to join us on that.

The other thing we would like to have you do as you leave this, these hearings, we represent not special interest groups. When we put minorities, women, and the handicapped together, we come out to be almost 60 percent of the population, and I'm sort of getting tired of people telling me that I am a special interest group.

I see a lot of you all sitting out there who fall into those categories. You're either, you know, you're female or you're minority and handicapped. I don't like being called a special interest group because I'm a U.S. citizen. I was born here. My grandfather, my great-grandfather, all of them were born within 30 miles of each other in Virginia.

We've been here a long time. There's nothing special about us. We're just citizens, pay our taxes, try to paint your house. [INAUDIBLE], we'd like you to take a position on that, too.

Why don't we just say to you, don't do it for any other reason than the fact that we turn this over to the kids. Everything that we are about, if we don't have the people coming behind us, our living would have been in vain.

I've got a daughter who is 22, struggling to try and find herself, making a lot of mistakes, but I did, too. I think she's making a whole lot less than I made when I came along.

The only difference between that is she knows how to make more than I did. [INAUDIBLE] I did everything I talked about, tried it all, but some things weren't known at that time.

That's the kind of kids I see out there, and I talk to them under the tree. They're scared to death. If you take some time to talk to those kids, you will find out that they are frightened.

They feel like we have messed up the world and are not going to give them a fair chance to arrive at the level that we are.

That's what this Task Force is trying to find. How can we change the way in which we educate young people in this country. We just happen to be dealing with minorities and the handicapped, but it wouldn't make any difference to me whether they were green or Chinese or Japanese or whatever.

If we are talking about education, we ought to try to educate them so that they can become better citizens, better producers, and live the quality of life, and so that those of us who lived ahead of them could feel better that we were passing on something better than we had.

Thank you all very much for coming to our testimony this morning. We hope you will come back this afternoon.

We are going to break here for lunch, and we will reassemble sharply at 1:30.

For those of us who are on the Task Force, we have two persons who are supposed to direct us to where we are supposed to go eat. If you would explain to Sue [INAUDIBLE].

[LUNCH]

DR. ADAMS: Our focus is one of attempting to document and analyze--analyze and document activities that should be ongoing to provide women, minorities, and the handicapped with opportunities to participate in science and technology.

This is a particularly important topic for us. We really don't comment about how important is this Task Force. We hope it is very important because we hope to become somewhat of an advocate for changing the way in which we serve these populations of persons within our midst.

The hearing this afternoon will proceed based on the persons who have been officially invited to testify on our program. They will be allowed 10 minutes in which to make presentations.

The bell will ring after nine minutes. We will allow some time for some questioning as we go along. The program this afternoon is a little bit heavier than it was this morning, and so we do want to keep this schedule moving.

At the conclusion of these hearings, there will be a report forthcoming that we will say something about at the end of the day.

If we have sufficient time, there are persons who have signed up for what we call sort of walking three-minute opportunities, and we will try to accommodate as many of those as we can at the conclusion of the scheduled hearings.

You will notice to my right that there is a person who is interpreting and signing for the deaf and I'm going to ask at this time, is there anyone in the room whom this service is required for? If so, would you please raise your hand. If not, we will discontinue.

Thank you very much.

We will ask that the persons who are testifying who we did not do this morning, would you please come down and speak into the mike because we are recording the sessions.

And also as you are responding to the questions, I would ask you also to be at the mikes, and I am going to ask my colleagues--these mikes are not picking up quite as well as we hoped for and some of our voices are not quite as strong as others, so we ask you also even as you ask the question, use the mike so that everyone can hear.

Our first person for the afternoon session is Thomas G. Sticht, President, Applied Behavior and Cognitive Sciences, Inc., San Diego. Welcome.

MR. STICHT: Thank you, Mr. Chairman, members of the Committee. It is a pleasure for me to be here, I'm pleased that I was invited, to have the chance to come and speak to this group, and to get some of the results of some work that [INAUDIBLE] over the last two years, particularly looking at technological literacy and the performance of people who would be declared functionally illiterate or marginally literate at the most within the military complex.

I'm going to frame for you kind of a military dilemma, that is a problem for the military, in terms of population demographics and the competence of the population.

Then I'm going to report on a study we did in which we examined the performance of people who had been declared functionally incompetent by the military, but who, when they came in, did their job performance quite well.

Then I would take to you about a review of about 50 years of research in the military on how to design literacy and technological training programs in such a way that it is possible to go to note literacy and technical skills at the same time in a way that is particularly useful for addressing the background knowledge of women.

So that's what I want to first do, is to give you something of the nature of the problem facing the military and our nation in general.

The problem goes something like this. At the present time we have a declining youth population. That declining youth population should bottom out around the mid-nineties.

This is causing a situation where business, industry, government employers, and the military are all competing for a shrinking youth pool, a pool that the military has traditionally filled its ranks with.

The other part of the problem is that whereas the overall youth population is declining, the population made up of minorities is increasing.

And that poses particular problems, and I hope to use the overhead projector, if I can.

This is a picture that shows the performance of a national representative sample of young adults in 1980. This was when the Armed Services Vocational Aptitude Battery was [INAUDIBLE] for the first time since World War II.

What I have plotted here are two sets of data, data for white males and white females, black females and black males.

What the [INAUDIBLE] show are the performances on the various subtests of the Armed Services Vocational Aptitude Battery.

There are two major themes I want to emphasize. On the one hand, we have a very large gap between Blacks and whites, in terms of their overall average performance, with Blacks scoring, on the average, approximately one standard deviation below the means for the overall population.

That is one thing to be concerned about. Notice, too, that that is true across all of these areas. It isn't simply word knowledge, or what would be called vocabulary. It is not paragraph comprehension alone, or reading comprehension.

It is also auto and shop information, mechanical comprehension, general science, electronics information, and so forth.

The other phenomenon of concern to this Committee is the curve that starts at the top here and goes down over there. That is the curve for females, white females, and that same trend, although depressed some, is there for Black females.

What you have here is a situation where white--well, let me put it this way, the females are better at kind of most, low-level [INAUDIBLE] skills.

Numerical operations means how rapidly can you add, subtract, multiply divide [INAUDIBLE] numbers. Coding speed is essentially matching a series of numbers to words, very rapidly, but not high-level [INAUDIBLE] skills.

What happens is this, is that as you go to words "reading comprehension" here, the curves for the males and the females come together, but as you go into the special knowledge areas, then the males tend to go up, the females tend to go down.

By the time you are out here, which is automotive and shop, mechanical comprehension, you are in the area where the composites are put together to select people for technical training.

It becomes clear then, I think, that females are going to have much less likelihood of being selected for going into technical training.

By the way, this turn is not only true for the Armed Services Vocational Aptitude Battery, you can get a similar kind of picture by looking at the Differential Aptitude Test of the Psychological Corporation, a widely used aptitude battery.

Females there perform very poorly in mechanical comprehension. The manual even for guidance counseling on that even suggested that if a female, for instance, wanted to go into architecture, that they might be suggested to them that their scores are considerably below that of males and so they might want to think about other opportunities.

So these test scores then pose the second part of the problem.

The first problem is the decline in the youth population with the increase in the minority, whose scores are going to be depressed.

That means two things. First of all, minorities will not get into the armed forces at the same rate as others, and they are not. They are disproportionately excluded.

And second, it means that even if they got in, along with females, they won't be assigned to the more technical jobs.

And I think that what we have here is a situation in which the premises that not only is the population of youth declining and minorities are increasing, but also there is a [INAUDIBLE] that the work in the military is growing more complex.

I read a report recently, something about, "Smart Bombs and Dumb People." Well, that is a bad way of putting it, obviously, but that's how they talk.

And so this problem of the growing complexity of the work, the decrease in the youth population, and the aptitude scores for females which keep them out of work in the technical jobs, that is a problem that the military has to address, as an arm of social policy of this country.

Now what we have suggested in the past is to, as it has done now, is to raise requirements during peacetime to get rid of people who have low aptitude scores.

And there have been three times in the past when there have been a significant number of lower aptitude people come into the military.

This graph shows that back in Korea, during the Korean War, there was a large number of what they call "mental category four" people. That's the low-aptitude people.

And then after this drop, and then along came Vietnam, and a project called "Project 100,000," where Secretary McNamara brought into the services up to 100,000 people a year who had been rejected earlier for being low aptitude.

They came in here. And then along at this point when the all-volunteer force, it is an interesting thing, this is a high proportion of low-aptitude people who came in by accident because the test had been miscalibrated.

So all these people were there and they didn't know it.

What we did is we studied the performance of people back during World War II who were low-aptitude, functionally illiterate. We studied the performance of the Project 100,000 people, and the performance of those who were missed, and came in under [INAUDIBLE].

I can show you a summary graph. If you compare the performance of those people in World War II to average aptitude people, it turns out that even in World War II with people who were truly illiterate, their performance was about 90 or 95 percent as effective as average aptitude people on indicators such as "Did they lose time?" or "Did they go into foreign service?" or "Were they rated acceptable or higher?"

They weren't promoted at as high a rate to E4.

During Project 100,000, again, we see the peace performance of the people, in terms of how they compare to average, they are within 80 to 95 percent, or in this case, 99 percent on rated acceptable.

When they didn't know they were there, they did even better, by and large, in the Army, and so what we have is a situation that suggests this, is that people are being excluded because of the belief that they can't perform well.

When they bring them in, however, they do perform well. Furthermore, they do this without a whole lot of special training.

On the other hand, the military has invested more money in research on special training than any organization on the face of the earth.

When we reviewed 50 years of work in this area, it turns out that in the late fifties and then again in the sixties, and then again in the eighties, the military has developed ways of teaching basic skills within the content area of the job.

For instance, in most basic skills, when you [INAUDIBLE] programs, people have to go through a basic skills program first to get their level up, so they can then qualify to go into some training, say, electronics technicians training.

We found by studying military work and its reported in this book now, a little plug for [INAUDIBLE]. It's called, Cast-Off Youth: Policy and Training Methods in the Military Experience. It is possible to totally integrate the basic skills training with the technical skills training, do them both at once.

Furthermore, in the prototype course that we designed here, an electronics technicians course, we took into account those female aptitude scores.

It turns out if you get something besides automobile ignition systems as the [INAUDIBLE] area in which you want to teach them electronics--for instance, we use a curling iron--it turns out we use curling irons, people are able to understand that better, males and females. I don't know why the males so much, but it is just this modern day and age, anyhow.[BELL] [laughter]

It makes a better context for females. We use flashlights, table lamps, curling irons, things of this type. When you do that, the female is able to import her own background knowledge.

The tests then become--these aptitude tests become self-fulfilling prophecies. They are generated by men to be given to women using men's interests.

It's not surprising then that sometimes women don't do as well on the tests.

Were they properly designed? Of course, however, we were able to show that the females could relate to this material.

Furthermore, we were able to lower the course requirement from a ninth grade level to approximately a fourth or fifth grade level.

But you didn't even have to go to a basic skills program. What you do is you enter into the technical training program that has been redesigned, and you don't read first, you handle flashlights and learn how they work.

We teach them when you push the button, that's an input; the light comes out, it's an ouput. The reason you do that is you teach them a systems way of thinking.

The reason for that, it turns out if you want to develop a more productive work force in the electronics area, it isn't on the basis of electronics theory, unlike what a lot of subject matter experts thought.

When we talked to them, they thought it was that basic theory which was all important. It is important, but what makes a true expert, it turns out, can only be found out when you try to build a computer that will be an expert.

It must then have the proper knowledge, the real stuff. The real stuff turns out to be, for an expert electronics technician, they have a way of thinking about equipment as functioning systems.

That permits them to more efficiently exclude or include certain kind of actions when they do their troubleshooting process.

At any rate, we designed the course to produce not only access to integrated basic skills or technical skills training for low-level literacy people or females, but we also designed a course, we hope, in such a way that would make the people more expert.

I believe my 10 minutes is up. Thank you.

DR. ADAMS: Thank you very much. Interesting. Will you please make sure that we know how to get your book. Most of us would be very interested in that.

MR. STICHT: There it is.

DR. ADAMS: Questions?

DR. JENKINS: Yes, I was wondering when you did this for women, did you distinguish between non-minority females and minority women, did you see any difference, did they all make comparable grades?

MR. STICHT: Yeah, by and large, when you design a program like that in such a way that you have first a kind of hands-on experiential learning, and then you proceed from that into sort of block diagram picture graphic representation, and then you do the reading and the math in that context.

Most people are able then to make that bridge, a sort of a recapitulation of a natural developmental sequence.

DR. JENKINS: As a result of your work, have more women been placed in the more highly technical jobs in the military?

MR. STICHT: Oh, nobody in the military does it. They just did the research. [laughter] It turns out that like in many other places, they spend millions of dollars on the research, but the reports are on the shelf, but most of the new scientists who come in don't know anything about the work, and, well, I hope that this will [INAUDIBLE].

It seemed to me that one recommendation might be that more use be made out of the dollars spent by the Department of Defense, both within the military and outside the military.

As I say, it is the only place, for instance, in the War on Poverty, where studies of how people's basic learning skills, young men, in effect, how the basic skills function.

Other programs, such as the Job Corps and so forth, delivered services, but they didn't conduct the fundamental inquiries on the learning process. The military did.

But you have to dig deep and hard to find the reports. They are buried away.

So, I think that the military is a gold mine of research that can be applied, both in the military and outside the military. I think that's one recommendation.

Another recommendation is this, is that the military now has spent billions of dollars, and more precisely, approximately $2 billion a year, to attract and recruit a higher quality person.

The category four people that I showed you went up and went down and went up. They've now, as soon as they found out that they had them by mistake, they've got that down quickly now to about 4 percent in mental category four.

It turns out that Congress has authorized an overall 20 percent. It seems to me they ought to be held to that, because that will not exclude as many of the people in whom they should be investing their training might, their capability.

And I think that particularly it's important that they do better designs to get the women involved. And the reason I say that is this, is the project that I'm working on now for the MacArthur Foundation looks at the intergenerational transfer of [INAUDIBLE] skills.

It turns out that people who went through Project 100,000--these were men--60 percent of them used the GI Bill later on when they were veterans. Research suggests that people who use the GI Bill have [INAUDIBLE] to go further in school.

Therefore, it would seem to me if we coupled that finding with the prevalent, widely known phenomenon--I guess it's widely known--that if you invest in the education of a mother, you invest in the education of the child. This has been known by the United Nation's Educational Scientific and Cultural Organization for decades now. It is becoming better known in this country.

So once you could get, in the jargon of the, of Defense, double billion dollars, you are ding to the dong, ping to the pong, that sort of thing [laughter].

So I think that we have an argument that not only encourages the fact that the data supports the notion that these people can be productive, the people benefit and so do succeeding generations.

We have to then refer back to Mr. McNamara's concern that the very foundation of national security is the human mind. We can't afford to waste those, as the ad goes.

DR. ADAMS: Thank you very much, very enlightening comments. We really appreciate your coming to testify for us.

MR. STICHT: By the way I hate to testify enough, but I do have to testify.

MS. EMERY: I just want to ask you one question about your research. Would there be some useful information in your research that would help us in transitioning of people who are separating from the military into employment in civilian life?

MR. STICHT: Well, I haven't given that that much thought, no, but in general I can say this, that we have a major problem that has been defined in this country today as the shrinking, decline in the number of marriagable men, which has a lot of spin-off into teenage pregnancy and so forth.

The men who went into the military under Project 100,000, who had been declared cast-off, when they got there, they performed, as you saw, quite well.

Furthermore, as I mentioned, they went on to use the GI Bill. But beyond that, their earnings are higher.

And so it seems to me that that is a strong argument again for the use of the military more in its human resource development level.

I don't have any information on the transition, although, as you know, some programs are underway now who use people from the military who have technical skills.

I taught at the Naval Postgraduate School for a while and I [INAUDIBLE] some of the officers as the high-quality enlisted people who were getting involved in that program. I think it is a very worthwhile program.

DR. ADAMS: OK, one more.

DR. RIOS: I have one related question. Those of us in the private sector, particularly those of us that do defense work, draw a great deal of our technician pool from the military, particularly people that have worked on systems like Patriot, Hawk radars, and things of that nature.

And what you are saying here translates into what I observe, that there are very few women and minorities in the technician pool, in the highly skilled technician pool.

But it also translates into the professional categories. Many of the engineers and scientists that spend time with the armed services then go directly into the best-paying jobs in the defense industry.

Do you have any statistics or where we can find them on the percentages of the skilled people at the technician level, because this is basically recognized by the Department of Defense contractors as where the technician pools come in?

MR. STICHT: Well, I doubt if the proportion of people in the, let's say, skilled category, might be called white-collar technicians and so forth, that now constitutes approximately 45 percent of the total forces in the military.

Approximately 40 percent are craftspeople who are semi-skilled in services supply. Only about 15 or 16 percent are actually combat-oriented people.

So there is a vast supply of technically trained people there. And I have no statistics on this kind of thing, although I know the phenomenon you are speaking about.

Many people who are trained, say, in the Air Force get out at very good paying jobs, the technicians in aircraft industry and other [INAUDIBLE].

Yes, it is an opportunity--when you are screened out of the military--see, one of the horrible things about all of this is during wartime they lower the requirements to bring people in.

During peacetime, though, then when you might have a chance of surviving to use those benefits, then the requirements are raised.

Now I think it is a question of ethics there and morality. You could pursue that from your Task Force.

DR. ADAMS: Thank you very much, thank you. Our next presenter is Ann Kahn, member of the National Science Education Board and Immediate Past President of the National PTA, and she is going to talk about the importance of schools and families holding high expectations for minorities and women. Welcome.

MS. KAHN: Before we start counting on my time today, I would point out there is an error on the list. It is not the

National Science Education Board. It was established by the National Academy of Sciences, but it is the Mathematical Sciences Education Board.

And you have a yellow sheet in that material that I am passing around that explains what the Board does, so I won't use time to explain that at this point.

I do want to indicate that I am the immediate national President of the PTA, and that is now an organization of 6.2 million parents of teachers.

I am also the immediate Past President of the Fairfax County, Virginia, School Board, which is the ninth largest school system in the country.

DR. ADAMS: Fairfax?

MS. KAHN: Yes, Fairfax, Virginia. And I'm going to be speaking from all of those perspectives, if I may.

The problem of the decline of minorities and women in science and math really has to be viewed against the kinds of larger demographic things that are going on, and are already evident in some of our larger states.

I am sure you are aware that by 2020 the 5- to 17-year-olds in this nation will be 23 percent Hispanic, 20 percent Black, and 4 percent some other minority. There are already major states like California, Florida, and Texas where the school systems represent the majority of minority students.

That will increasingly happen during the next several years.

Also please recognize that the current dropout figures in school are disproportionately minority students. Of the 25 million U.S. adults who have dropped out of school, asking them a questionnaire is enlightening, because 83 percent have no idea what DNA was, 33 percent have no understanding of what radiation was.

The figures also show that 80 percent of the prisoners in jails are high school dropouts, and they also are disproportionately minorities.

Every prisoner now, the national average is that it costs us about $24,000 a year to support someone in prison. The average college cost is now $3,000 a year, and it is really true, finally, that what used to be a joke is now so, that it costs more to keep a person in a state pen than it does to keep them in Penn State.

If you consider all of that against the fields in which there is the least minority representation--math and science--and probably then recognize that the worst villain in driving many of those children to failure in school is mathematics.

This is no longer just a personal tragedy, although it is that as well, but we are now really beginning to understand that this is the undermining of the national capacity to be creative and competitive and also to produce adults that are going to be able to function as educated citizens.

One of the real barriers to success in mathematics is the impression that there are only a few elite students that are going to be able to make it. And that works not only against the personal achievement of women and minorities, but it also is a real disaster in terms of our national best interest.

Bob White, who is the President of the National Academy of Engineers, put his finger on the problem when he indicated that mathematics should be a pump, instead it is a filter.

For all too many students, mathematics as it is currently taught today in all the schools is a filter. School systems are only beginning to understand that it is not enough for them to increase the standards, they have to be able to help this broad spectrum of U.S. children reach those standards in the fields of math and science, and in the use of technology.

That is something that is really fundamental to our national good health.

The filter approach has been the [INAUDIBLE] on women and minorities and it has foreclosed individual career options and national aspirations at the same time.

A youngster who now is not up to the pre-calculus level in mathematics before going on to university has foreclosed 60 percent of the college majors before he ever sets foot inside a college campus.

Now that is a disaster. And that cannot be remedied at the high school level. It has to be remedied much further back in the elementary training that goes on.

Industry is looking for a pipeline of talented people, scientists and mathematicians, but more than that, they are looking for people who are problem solvers. That is the skill which is the most valuable to them and it is the skill that is the most valuable to us as a nation.

And it is in mathematics that that skill is most evident or most missing.

Youngsters need to understand math teaches them a rational way of how to communicate the questions that they face and the results that they find in the range that others who are skilled in problem solving can understand.

There is a decrease in the number of young people in this pool of skilled problem solvers, and that can't be addressed without focusing on the increase in the whole pool, instead of trying to sort out who ought to get into the pool.

Now what is wrong now? Why has the pool become so limited? How are we going to reach those students who now are excluded from the pool and excluded very early on?

The changes are clear, ladies and gentlemen, and they are research driven, both in the curriculum and in the teachers trained to teach mathematics, and we must break loose from this tedious, rote teaching that now takes place--eight years of constant repetition and review which drives children right out of mathematics and right out of the career options that they would have as adults.

Instead, we needed to move into the more interesting concepts of how you apply mathematical knowledge, and how math is relevant to whatever you are going to do in life, whether or not you go on to the university education or not.

And how much that is now eased by calculators and computers, most of which have not made a dent in the teaching of mathematics at the elementary and secondary level.

You have to understand that these are not toys. These are tools that students who are skilled in their regular use can understand as a way to move up out of the constant eight-year repetition on arithmetic and instead into the concepts of mathematics of geometry and algebra at a much earlier point.

The international comparisons on that are devastating. In France and in Russia, for example, the concepts of geometry are integrated into that kind of teaching of math. We are still fiddling with arithmetic.

I would love to ask you all, which I have done in other cases, how many of you in this last month have even done a long division problem by hand. It would be extraordinary to have more than one or two hands go up. Usually it would be a teacher.

[Several people speaking at once.]

If you ask that in a [INAUDIBLE] setting, there is not one hand that goes up. Once you know how to do it, you don't have to keep doing it for eight years. You now have a calculator that can do it for you.

Now, if you do that, and if we begin to use age-appropriate language, then if we think there is an enormous possibility that we begin to stave the tide of dropouts. Dropouts don't just start at the ninth grade. They start way back there at fourth, fifth grade, when they begin to realize they are not going to make it, and everyone has told them they are not, and that is a self-fulfilling prophecy for many minority children.

In projects, like the Chicago Math Project or the Family Math Project that grew out of the University of California at Berkeley, you can see that turnaround by a different way of establishing the curriculum and by a different method of teaching which involves students, instead of uses them as a vessel into which the teacher simply pours information.

Now that has got to come early on. You cannot wait until the crucial years of middle and high school, because by then schools are making that distinct division as to who is going to go on and who is really going to go into business math, which is a different term for math than--there should be, all the children ought to be exposed to mathematics.

It will empower them and make them competent to make their own career choices, not to foreclose at the sixth grade, for heaven's sake.

We also need to improve the way in which we assess mathematics achievement. We are the only country in the world that is hooked on the multiple choice format. There is not another country in the world that sticks to it the way we do. It is a religion with us.

The clear findings show that that limits our ability to probe what students really do know and it tends to be a drag on the kind of curriculum reform that has to take place, because everyone wants to look good on the test, so they keep teaching, even though they know what they are teaching and how they are teaching it is not up to what we know we ought to be doing.

But the test is all important. So despite efforts, for example, to counter cultural bias--and those efforts have been enormous on the part of test makers--minority students for years and still today have suffered a misrepresentation of what their skills are by virtue of this national addiction to multiple choice testing.

Even in Israel, for example, in a multiple choice format, the student must then write a few sentences just to find why you chose the multiple choice answer that you chose.

It is a totally different version of what we have where you try to eliminate what you think can't possibly be the answer and then you guess.

We need to take another look at international comparisons that also show us how critical a role parents play, and I know you are going to hear more about that from Dr. Stevenson, but all parents, and most particularly minority parents need to understand how important their own expectations are to the educational goals that their children set.

I was interested in the speaker that preceded me [BELL], pointing out how different people actually accomplished when they weren't sure what their expectation limitations were for them.

Parents who haven't done well in math and science are particularly at fault, because they think that they did OK in the job market without it and that their kids will. That has no relation to what the reality of the job market that their children are going to face.

And I'm including in my material being passed around to you some of the materials that we have circulated to 30,000 local PTA presidents to try and break that cycle of the parental lack of understanding of how much their expectations can make a difference.

The media has a tremendous role. We're reaching a generation of TV watchers, and children who are unsuccessful in school are even heavier TV watchers. And the use of the media for something like "Square One" in mathematics can have the kind of breakthrough that Sesame Street had in the development of language, and we ought to encourage that kind of use of mathematics.

The government played an enormous role after Sputnik in helping upgrade the quality of teaching of science through federally sponsored teacher training workshops that were funded by NDEA. We still have the results on many of those wonderful teachers, but we are losing them to retirement because time is passing by.

So it is necessary now, again, for the government to begin to do something on that scale to revitalize teaching skills in what is fundamental to every science, which is the teaching of mathematics.

They also have the ability in the government to work at research data, which individual school districts cannot do. They need to have more research that can help schools break this traditional role of using math as a way of filtering students instead of using math as a pump to keep students moving along into math and science.

We also need more research on alternative modes of assessment that will help us get a fairer representation of what the children, including minority children, really know.

The Math Science Education Board, which you will see as you read that material, is going to just do great things. They have only been in existence for two years and are making wonderful progress in beginning to revitalize the math curriculum, the teaching of mathematics, the assessment of mathematics, and the particular interest we have in minority achievement in mathematics.

I won't go into that any further. I hope that you will read it because it is important that we not have minority children hounded out of the scheme even before [BELL] they really get started.

If I might just finish the last paragraph [INAUDIBLE].

What happens to the nation if we don't make this shift? Take a look at those same 25 million adults who are non-productive, dependent, who see the world as out of their grasp and very hostile.

Eighty percent of those people in a recent test agreed that the only way they would know what was going on was to rely on leaders and experts who can be trusted.

The interesting thing is that when the same question is posed to college graduates, you have the exact same reverse of that. That same percentage--80 percent--of college students are unwilling to rely on leaders and expert who can be trusted. They rely more on their own ability to make good judgments.

Errol Hodgkinson, Dr. Errol Hodgkinson posed a crucial question to us. How many more dependent, [INAUDIBLE], passive, and non-involved workers and voters and citizens are we willing to add to that 25 million? We already have 25 million.

Our ability to open up to minority students the options in life that have been available to majority students for years is going to show up first in this area as to who is in power to inform them in mathematics and who is filtered out. And it is a choice which the government, and through your Task Force recommendations, we hope, can facilitate.

It is because there are 16,000 local school districts, a matter which local and state school authorities will have to deal with, but you can give this a very hearty shove, and we hope that you will.

Thank you.

DR. ADAMS: Thank you very much. Comments, questions? Dr. Williams.

DR. WILLIAMS: The question is, you [INAUDIBLE] with respect to parental involvement because while indeed I can see it is very important that our judgments be more elastic, the issues of curriculum changes, teacher preparation, different modes of assessment certainly as you focused on that in the science education are very important.

What would you regard, if indeed they are important--I fully agree with you and they're almost self-evident--the problem-solving exercise, what would you identify as the prime impediment to making that change?

It is so absolutely clear that the nation in terms of elementary, middle school education needs this curriculum with a highly competent mathematician as a professor with appropriate examination, is not being done.

And what I'm asking you, sort of making it a question, my question ranges from whether the goals in mathematics and sciences are actually [INAUDIBLE] with the larger society, would they be even more narrow issues.

What do you think is the ultimate impediment to making that change?

MS. KAHN: I wish that there were that simple an answer that I could point to a single one. Let me point to several.

One really is parental expectations, and we are--you know, the old [INAUDIBLE], "We have met the enemy and he is us." When we say to our children, "Math is not important"--everybody says, "Well, we never say that."

But when you say to your children, "I never worry about what my bank statement is, because the bank is always right," you are sending a message to the child: You are not empowered to be able to figure that out for yourself.

And that is the message that children understand.

When you talk about literacy only in terms of being able to read and not technical and mathematical literacy, which you hear very little about how, you, too, are sending a message to children, that the only literacy that really counts is language literacy, and indeed that is not true.

When you allow state legislature after state legislature to simply feel that they have absolved themselves of any responsibility by setting what is called a minimum competency and then finding out that that minimum competency is the level toward which classroom teachers, textbook publishers, and test makers will aim, then we are all guilty of that.

So this is not an easy thing to do. The NSEB, together with groups like the PTA, with the mathematical professional associations, will be spending the next several years trying to make this an issue that is a laymen's issue.

As long as it is only a mathematician's, which by the way, I am not, then we will get nowhere. And math teachers understand what the problem is. They would be delighted to be able to change their curriculum, but they will have administrators and parents go down and saying, "Don't change that, because that is not what the test asks for. I want my child to have a good test, so that he can get into the university I want him to go to."

Everyone is going to have to look at this in terms of radical change that is going to have to take place, and we have made enormous progress, I think, in two years.

I hope you will take a good look at the materials that went out to PTA presidents. These are laymen, these are not mathematical experts. We got a very good and positive result of that.

They are talking about this issue. Last week I was in Montana at a state PTA convention. This is not ordinarily an issue that one would find discussed at a PTA convention. It was discussed. They do understand it is their children's future that is at stake, and they will deal with it.

DR. WILLIAMS: I'm pleased to hear the answer. My own perspective is your last point, that what needs to happen is that the citizenry at large has to make it almost equal to any other condition of citizenship, and then it will happen.

MR. MORRIS: Ms. Kahn, I was interested in your early statements, that we must break out of the rote method of teaching math, and I would like to give you my personal experience.

I graduated from high school in 1936, having been subjected to the rote method, but at the same time I completed successfully and had straight As, as a matter of fact, fortunately, in calculus, in college algebra, in the higher geometry courses that are taught at the university level.

What is wrong with combining the two, because I happen to be a firm advocate of the rote method, as being a means of training the brain so that a person knows what two and two is, rather than having to rely upon a calculator to tell them that answer.

MS. KAHN: You are in a unique category. You are in about two percent of the American population, and only about two percent of American students go on to calculus.

If we are going to reach more than that two percent, then we are going to have to do it differently. Those people who are successful at it, as you obviously were, that's great.

The staggering facts are that 98 percent of the children who go through America's public schools and private schools have not been successful with that method and, in fact, have been turned off by it.

So I think that the possibility of reaching deeper into the other 98 percent is what ought to drive us to see if there are not other ways that we can do to increase the two percent to have more young people get the calculus as you did.

Two percent will not fill the nation's needs. It doesn't fill it now, and as we get into the 21st century, it will be a technical disaster unless more than two percent are able to get to that level.

If I might add one other thing. I don't think anyone thinks that we should throw out the ability to know how to do those things. What we are saying is a terrible waste of time is to completely review, review, review a technique which can be learned in much shorter order in every other country of the world, and we have no reason to believe that our children can not learn that as quickly as well.

That then frees up the additional time that is now used in doing this over and over for eight years, and allows us to begin to get into some of the concepts of algebra and geometry at age-appropriate levels so the children are more excited and interested in mathematics.

In the end, if we love it and they hate it, they still will not go on with math.

And so our hope is to get more people who will be able to be successful at it as [INAUDIBLE].

DR. ADAMS: Thank you, Ms. Kahn. I think we have

[INAUDIBLE]. We would appreciate your comments to us. I would say that you represent a group that we are going to have to deal with. We definitely have to get focused on the parents, because we realize that parents are a tremendous part of this whole equation. We will be perhaps looking at your organization or similar organizations as they go forth to assist us in getting this message out to parents.

We appreciate your testimony and we thank you very much for coming.

Our next presenter is Mr. Clennie Murphy, who is the Deputy Associate Commissioner of Head Start.

DR. MALCOM: [INAUDIBLE] and what we mean by rote. My daughter at that time was one times whatever it is and zero times whatever it is on work sheets, and she told me everyone knows if you multiply the number by one, it leads to the number, and if you multiply by zero, it leads to zero. It's true today, it'll be true tomorrow, and that from my seven-year-old. That's what we're talking about.

DR. ADAMS: Welcome. I see you've brought someone along with you. We will allow you the opportunity to introduce that person. Welcome to the Task Force.

MR. MURPHY: Thank you. I want to thank you for giving us an opportunity. My name is Clennie Murphy. With me is my colleague, Mrs. Roxie Kelly. We are both staff members at the Department of Health and Human Services and with the great Head Start project [INAUDIBLE].

I would like to give a statement for the record and after that, let me answer any questions that you might have at an earlier period.

Project Head Start is a demonstration program which provides comprehensive child development services for preschool children, primarily aged three to five, from low-income families.

Since its inception in 1965, Head Start has provided educational, social, medical, dental, nutrition, and mental health services to over 10 million children and their families.

The program was launched in 1965 by the Office of Economic Opportunity as part of the great program, War on Poverty.

It has now become a program of the Administration for Children, Youth, and Families at the Department of Health and Human Services.

The design for the program resulted from concern that almost one million children from low-income families entered school for the first time each year and these children begin kindergarten with serious health problems and a lack of self confidence.

They are usually behind their classmates and assigned a potential failure, dropout, and future welfare client are present.

By the way I will add here that Head Start has been in existence since 1965, started by the Johnson Administration, but clearly has been appropriately supported by all political parties.

Project Head Start was launched to help to break the cycle of poverty by providing preschool children from low-income families with a comprehensive program to meet their emotional, social, health, nutritional, and psychological needs.

It began as an eight-week summer program and for about five years was that model.

It then converted in about 1970 to become a full-day program, serving roughly 450,000 children. The appropriations for this program has gone from $96.4 million in 1965 to a whopping $1.206 billion in fiscal year 1988.

The program is locally administered by 1,300 community-based non-profit organizations and school systems. Grants are awarded by regional offices from the Department of Health and Human Services.

There are four major components to the Head Start program. They are education, and in the health area would provide medical, dental, nutrition, and mental health. Their involvement is a very important response from social services.

In the education component, it is designed to meet the child's individual needs. It also aims to meet the needs of the community and serve its ethnic and cultural characteristics.

The program has a very extensive bilingual program for children. For example, one teacher aide must speak the native language of the kids who are in the program, and we have a large number of kids who are not, where English is not the primary language.

Every child receives a variety of learning experiences to foster intellectual, social, and emotional growth. Children participate in indoor and outdoor play and are introduced to concepts of words and numbers early in the program.

They are encouraged to express their feelings and to develop self-confidence and the ability to get along with others.

Head Start programs have a low child-staff ratio, and I'm sure you have had lots of discussion on that. Staff members receive training in child development and early childhood education, and they learn how to work with handicapped children, who now account for about 12.2 percent of the Head Start total population.

By the way, we are the largest program in the world which serves mainstreamed handicapped kids.

The health program emphasizes the importance of early identification of health problems. Since many preschool children of low-income families have never seen a doctor or dentist, Head Start provides every child with a confidential health care program, including medical, dental, mental health, and nutritional services.

Children receive a complete examination including vision and hearing tests, identification of handicap conditions, immunization and other exams. Follow-up treatment is provided for those kids where the problems are indicated they need that.

Again, we are the largest single delivery of health services to economically disadvantaged children in the world, the Head Start program.

We have a parent involvement component. Parents are the most important influence on a child's development, and an essential part of every Head Start program is the involvement of parents as the primary educator of their kids.

We also have in the Head Start program, I think which is a major part of the Head Start program, is having parents as decision makers. That gives a little headache to our administrators, but it serves a very important role as having parents have a say into who is going to be hired in that program, what kind of curriculum [INAUDIBLE], and they play a primary role there.

However, we have gone to get this point now to realize that if we are going to see any substantial growth in our kids, if we are going to see an impact, then the parent has to be the primary educator of that child.

We employ parents, they serve as volunteers in the classroom, as paid aides to teachers, cooks, as bus drivers, [INAUDIBLE] supervisors of play activity.

Parents basically receive a preference for employment in our program. It is important to mention here that in America there are probably 37 million functionally illiterate adults in our society today.

We have a major program of a number of parents in our program who are functionally illiterate, who cannot help their kids to do homework.

So we are going to launch a major program this year in adult literacy, trying to move parents from second grade to fourth grade, eighth grade to tenth, tenth grade to get their GED. So that would be a major part of the Head Start program.

Then the social services component of Head Start, and basically that component is to help to link our parents with other social systems in the community. Head Start is not designed to serve and to solve all the social ills of this country, and so we are not going to take that on our back.

However, we think because our parents are economically deprived that it is our responsibility to link these parents into the social service system, and to move those social service systems to help those parents when they leave Head Start.

We have had a significant impact on the community, and we have a report put out by Kirschner and Associates in 19--I want to say 71 or 72, which took a look at the various social institutions in the community, and while Head Start had only been in existence for seven years, we saw from 1,000 to

1,400 changes made in the communities because of the impact of the Head Start program, as a result of plans to have an impact on social programs there.

Of the 450,000 children enrolled in Head Start, 4 percent are American Indians, 22 percent are Hispanic, 39 percent are Black, 32 percent are white, and 3 percent are Asian.

The composition of the Head Start staff, which numbers about 79,000, reflect basically the same ethnic mix. The majority of the staff are women, many of whom are single and heads of households.

One-third of the staff are parents of current or former Head Start children. Forty percent of our classroom staff have degrees in early childhood education or have obtained a child development associate degree.

I would like to mention here that in 1965, most of our schools of higher education had departments of home ec or elementary education. There were very few departments of early childhood at that time.

Head Start has played a major impact in adding to a number of institutions departments of early childhood, and we think there is an art of working with young kids, and Head Start has tried to play a major role in developing that [INAUDIBLE].

In summary, Head Start has provided an important opportunity for low-income, minority, and handicapped children and their families. The training and employment opportunities provided for parents [BELL]--one last minute--means that many families means that many families have been removed from the welfare roles and that means a brighter future for thousands of children.

We are not trying to study anymore whether Head Start works. We know Head Start works. What we are trying to do now is to look at systems of diversifying the program and making it work better.

Thank you.

DR. ADAMS: Thank you very much. If I could have the first say, a couple of things from you. If you were sitting where we are sitting and you had to make a major recommendation that would impact what you are doing, i.e., in regards to Head Start, one, what would that be?--you could give us one.

Are there some issues that we ought to be specifically concerned about that the [INAUDIBLE], so that we can implement it and help you to get it? [INAUDIBLE]

And third, I guess, I would ask you, how can we as a Task Force put into place statements that might magnify that?

MR. MURPHY: Well, first, I want to say that--I want to make it clear that Head Start is a program for economically disadvantaged children, primarily, and for those families.

As a Task Force, I think you have to look at that population. There are 2,700,000 kids who are economically disadvantaged, and as a result of that, they are disadvantaged in a lot of other areas.

I think there has to be programs for this group. There are nuggets in there, there are kids who have an ability to succeed in the science area, in the math area, and I think that because of our programs that are designed for mainstream Americans and middle-class Americans, we do not have the kind of programs with the kind of specificity that should be there to help those kids.

Staff-child ratio is a real concern. I think that if you are going to work with this group and you are going to give them the kinds of training that they need, I think you have got to talk about a system for having instructors and room size at a level at which training and instruction can [INAUDIBLE].

And most important [INAUDIBLE] is people are performing [INAUDIBLE] is that a little bit of that, is that the primary education of these kids and of parents. The result we have is that when the kids leave us in Head Start, they do well, but at about the third grade, those [INAUDIBLE].

Our usual statement for that, we did good for the first few years, and the public schools [INAUDIBLE].

However, however, that doesn't help the family, who still suffer. We have a responsibility. So we are trying to do some transition with the public schools.

The parent is not aware of Program 99, Program 88, Program 66. What they need is some sort of system where they put their kids in and those kids really move through the system as opposed to a lot of diversified programs. I would recommend you look at that.

DR. ADAMS: Whole hands full [INAUDIBLE].

MS. BISHOP: Just to follow on what you said, and it was a question in my own mind, and maybe you spoke to it. Head Start, you said, works, but yet we find, as you pointed out, when you go from Head Start and you get to the third or fourth grade, as someone spoke before, then all of a sudden at the fourth grade level, we start getting kids who are failing or who already know that they are going to be dropouts because I have already--something has happened which will tell them that they are not going to go on beyond that.

Would you like to surmise what happens between Head Start graduates and the fourth grade or the fifth grade to get this attitudinal problem?

MR. MURPHY: Right. We have a--a couple of things happen there. When our kids move into the kindergarten, first grade, they are aggressive kids. We have responses back to them, we have a theory that, child development, a child develops at their own pace.

A number of other kids come in who don't have that, and we think that the elementary school teachers spend a lot of time with those youngsters who are not at the Head Start, at the same level as our Head Start kids would be.

So, in effect, some of our Head Start kids are held back. A lot of the self-confidence and the aggressiveness that they have received in the Head Start program, that's not there.

We think that the curriculum we use in the Head Start program has to be carried over into the public schools, and there has to be some consistency there.

Dave Weikert in the [INAUDIBLE] program--aware of that study--we think that that kind of activity will have to be carried on.

The other thing is that we think that our teachers need a different kind of orientation, no matter what the [INAUDIBLE].

DR. CLUTTER: If I heard you correctly, you said that a very low percentage of the Head Start children are Asians.

DR. ADAMS: Speak up.

DR. CLUTTER: OK. A very low percentage, I think you said 4 percent, 3 or 4 percent of the Head Start children are Asian?

MR. MURPHY: Yes.

DR. CLUTTER: Is there any particular reason for that? Are they not economically disadvantaged? Or why aren't they in the program?

MR. MURPHY: Well, one of the reasons is that proportion of the population is just on the increase, so that would be the reason for that.

And in the communities where there are Asian populations, we have a larger number. But that is true, in terms of [INAUDIBLE], I would say that, we have found that there are fewer in that group.

But, basically, Asian-Americans are on the West Coast, and we now have [INAUDIBLE] and other pockets here, but that percentage has increased by 3 percent over the last few years.

Just as when the program first started, 55 percent of the program was Black, 15 percent of the program was Hispanic. Now 39 percent of the program is Black and 22 percent of the program is Hispanic.

MS. EMERY: Dr. Murphy, I'm just wondering, I would like to take a look at the curriculum issue, and I'm wondering how flexible each of your Head Start programs are.

In other words, could you take a family math program that Ms. Kahn spoke about, coming out of California, and integrate it into your adult literacy program so that children and adults are working together on that?

Would you have that flexibility?

MR. MURPHY: Yes, yes. Our programs develop their own curriculum. One of the concerns we have is we are training our teachers and we have to do that at the same time. So we want to be--while we want to project the idea of child development, kids moving at their own pace, if you are a child development associate, you have what is equivalent to about 30 hours of on-the-job training.

Teacher observation gets to be very important in making judgments on how to do this, develop individual lesson plans for the kids.

So you want it to be structured enough to make sure that that happens.

MS. EMERY: But you do have the possibility of...

MR. MURPHY: Oh, yes, yes.

MS. SMITH: Can you tell me if the curriculum now has a heavy emphasis on science concepts. Have you ever done anything [INAUDIBLE]?

MR. MURPHY: We do not have a heavy emphasis on science concepts because the basic theory that we [INAUDIBLE] is school readiness.

Now let me tell you what we do have. We are involved in the very exciting program, Living in Space. And we have a program now where we have our kids becoming young astronauts.

And the concept is that that gives a certain amount of pride, it's that kind of thing. So that's what we do, both try to teach those concepts and whatever happens--well, we know the child development, why we claim that, yeah [INAUDIBLE] with that kid.

But basically, everything we do, we try to integrate that into our program. So we have this as an enrichment module to our program.

I would just like to ask the panel a question. Could I see the hands of those of you who have heard about Head Start before I came?

DR. JENKINS: May I ask you a question?

MR. MURPHY: My colleague here wants me to mention something which is very, very important, and that is class size. Basically we have a policy where we have one teacher and one aide to every 16 to 17 kids. That makes a big difference.

DR. JENKINS: I was going to ask you about the sister program follow-through?

MR. MURPHY: Yes.

DR. JENKINS: Is that still operative?

MR. MURPHY: Yes.

DR. JENKINS: And is the...

MR. MURPHY: And if I wasn't before the Committee, I would tell you a few things, but.

DR. JENKINS: Is it comparable to Head Start?

MR. MURPHY: No, well, the idea was to follow through, and that was to pick kids and then follow through. What happened in some communities, what they did was they set it up so Head Start kids could go into the follow-through program, OK, and then a few other programs that until they caught up.

In other communities, they took a whole new group into the follow-through program, and I think that has caused some problem for us, and that's when I have said it is very important to talk about working with these kids.

See, our kids aren't culturally deprived. Our kids are economically disadvantaged and going with that carries a lot of other things, and I think that's what this Committee has to work on.

I mean they've got to work on that idea of working with those, those remedial skills. And by the way, 50 percent of poor people in this country are white.

However, 39 percent in this program are Black and 22 percent Hispanic. See that disproportion there. So it's something happening to the minority population, that this program is there for.

And we have got to take a look at that in this country and we've got to take a look at in terms of helping this group to catch up and maintain those gains.

And our philosophy is, that's with the parents. You cannot do that by sending them to school and expecting them to come home to an environment that is not conducive to learning.

And so that's what we are pushing. We have this joke about, you know, send our parents on to the PTA, and so they can begin the revolution of the PTA.

But that's the [laughter].

DR. ADAMS: Thank you. Thank you very much, Mr. Murphy, for coming to us. We appreciate your testimony.

The next presenter is Dr. Harold W. Stevenson, Center for Human Growth and Development, University of Michigan. He's going to talk to us--we've heard about him quite a bit--he's going to talk to us about what we hear that the performance of Chinese and Japanese American children in elementary grades, and we have heard a lot about this and heard about your work.

I'm particularly interested in what's happening.

DR. STEVENSON: Well, thanks a lot. I think if we're talking about improving mathematics and science in women, minorities, and the handicapped, we have to talk about in the United States the improvement for all children because you don't want to end up as an elitist society where only a small portion of our population is well educated.

But we want a population in which all our citizens are conversant with science and mathematics.

And I think the reason that our studies in Asia are interesting to a group such as yours is the Asian children do so very well in mathematics and science, compared to American children.

And perhaps by looking at what happens in Asia, we can get some cues about what we are not doing here and some things we could do.

No one is so naive as to think that we are going to transpose what occurs in Asia to the United States directly, but you can make adaptations and get a different kind of reflection and image of yourself by looking at people who are successful.

I think we sometimes fail to acknowledge how extremely far behind we are of Japanese and Chinese children in their performance. I think the IEA studies--International Education Association studies--in terms of mathematics, have indicated that American youth in the eighth grade and 12th grade are learning at the average of the 20 nations that have been involved in this study.

Whereas the Japanese children in the eighth grade are number one and at the 12th, particularly in mathematics, at grade 12, the Chinese children in Hong Kong are number one and the Japanese children are right behind them.

So these cultures, for some reason, set of reasons, have been extremely successful despite, say, Taiwan, which has been a developing country, despite China, which is a developing country, Japan, which is a well-developed country, and yet all of them are producing high performers in mathematics.

We have been interested especially in young children and we have studied five-year-olds, first graders and fifth graders in Taipei, Taiwan, in Beijing, China, in Sendai, which is in Japan, in Minneapolis, and in Chicago.

And to give you an idea of the kinds of things that we found. By the age of five, American children already are behind the Chinese children in reading. At the age of five, they already are severely behind the Japanese children in mathematics.

The differences increase at the first and fifth grade. We are behind and continue to be behind Chinese and Japanese children from then on.

For example, in Minneapolis, we have studied 20 classrooms of fifth grade, 20 classrooms in Taipei, 20 classrooms in Sendai.

If there are problems in Minneapolis, there are certainly going to be problems in other major metropolitan areas of the United States. What we found is that only one classroom of the 20 fifth grade classrooms, for example, in mathematics was able to perform as well as the worst of the 20 Sendai classrooms.

In a more recent study, we've studied 39 Asian schools and 20 schools in Chicago, and this includes--these are all representative samples. In Chicago, there is only one school--and this includes North Shore, suburbs, and inner-city schools--there is only one school in Chicago at the fifth grade that has a mean score as high as the lowest of the 31 schools that we studied in Asia.

There is no overlap in geometry. That is, there is no school in Chicago that even approaches the average score for the 31 Asian schools.

We know it is not only in mathematics. We know it is also in science, that is, American children doing poorly [INAUDIBLE].

The question is why? Well, there are three possible reaons. One is intelligence, one is experience at home, one is experience at school.

One thing that magazines liked to quote several years ago was that the Japanese kids are simply brighter than American kids. This is ridiculous. There is no [INAUDIBLE]. There is no--there are no data to support the fact that Asian children are brighter than American children.

So we can't use that copout, and say, well, the reason that they are doing better is because they are brighter. That just doesn't make sense.

However, when we study schools, we know that there are some very serious and very strong differences in the way children are taught, and I think it is very important to look at some of these differences, not just in the amount of days they are in school or the hours they are in school, but the way they are taught, the vivacity, the eagerness, the enthusiasm of both the children and teacher in Asian schools as they are taught mathematics.

It is an exciting thing to see mathematics taught well, and they teach it very well over there.

The thing I want to tell you about, though, are some of the home factors. There are three--a great many--but there are three I want to emphasize, and unless we can change some of these, some of these everyday experiences, I think it's going to be very difficult just to change our schools.

And one of these was I find most distressing about the United States has to do with our fundamental beliefs about the degree to which children are capable of learning a standard curriculum.

For some reason or other, and some social historian needs to investigate this, we have gone from a culture that emphasizes the importance of experience to a culture that emphasizes the importance of innate abilities.

Asian cultures believe that the human being is malleable, that is, depending upon the experiences, you can produce different kinds of individuals depending upon what you put in, in the way of experience.

This is not to say that they are so naive that they don't recognize their individual differences. But the basic assumption is that all children should be able to accomplish the regular curriculum if they are taught properly and if they study diligently.

I think this is the lesson which we have to learn. That is, to the degree that we believe that differences from other individuals are due to innate factors, and no matter how hard certain children study, they still should be put in particular kinds of classes and they have no hope of succeeding beyond those classes, we are going to have a very hard time in modifying the education, not only in science and mathematics, but in every area.

So the first lesson that I have learned in these Asian studies is the usefulness for society of the belief that all children are capable of learning what the schools have to teach.

And, of course, then the problem is you've got the schools organized so that they aren't teaching in a way. It is not just a one-sided thing.

The second thing I have learned and emphasized several times and that is Asian children are part of a family. They are part of a group. As a member of the family, as a member of the group, there is an interdependence among these individuals, so that the responsibility for the child's education is not left just to the child, but is a source of activity and concern for the whole family.

So that the family, I think--you keep hearing this, and it is such an important factor--that unless you get the family involved in being interested in education, pointing out the value of education and attempting to assist the child to the degree possible in education, it will be very difficult for our very hard-worked teachers in America to accomplish the kinds of tasks that might be put upon them.

The third thing--the last thing that I want to exercise is to those standards that we have in the United States. That is, we don't really believe the children are capable of learning a lot of this stuff.

And so, and we don't look at other countries. That is, although some people are aware of what happens in other countries, the American population isn't. [INAUDIBLE] think American schools are doing a wonderful job. They think the kids are just fine.

For example, in a recent study we did, 68 percent of the parents say that they are very satisfied with what their children are accomplishing in school. They are very satisfied because the standards are much lower for what children can do than they are in other countries.

Well, so, I could tell you many more things, but the three things I do want to emphasize then that have come out of our studies of the Asian children and their population, compared to the American children, is not only that they do so very well, but the big difference in our belief systems about that fact that children are able to learn if you teach them properly and if they work hard, that the family has to be involved, and children can't do this alone.

It is an interdependent system and they have to work with children so they can accomplish something.

And the third thing is that we have got to raise our standards and reduce our hyperoptimistic evaluation of how well our children are doing because in the competitive international world that is going to exist for those children, they really aren't doing very well.

Thank you. [BELL]

DR. ADAMS: We have a couple minutes left over here. We appreciate that. I think all of us have been wrestling with just those kinds of things. I know we've heard that a lot since we have been working on this Task Force with regards to the fact that children can learn what we expect of them.

And I think we have to emphasize that. We have to hear that. Children mirror what we expect of them. And we set high standards and we teach them very well and we let them know what you feel about what they learn, and [INAUDIBLE]. I hear you saying that that's what they do. I was afraid that [INAUDIBLE].

We can talk about the dropout rate in this country, and we've got a 32 percent, almost a 35 percent dropout rate. We're not bothered by that.

And the first time I looked at Japan, the headlines read that 5 percent were dropping out and they wanted to find out why. I mean they were worried about 5 percent dropping out, and we kick 30 percent of our students out, we don't--there's no whimper in major cities [INAUDIBLE] in Washington this fall, and I mentioned that in Louisiana they had a 42 percent dropout rate.

The man who was from New Orleans [INAUDIBLE].

So I think we do have to do something--so we appreciate that [INAUDIBLE]. We would like very much to involve you in helping us to get that message over. We would like to work with you, and I think I can speak for the whole Task Force--we'd like to work with you to help get that message out.

That's a message that has to be presented to the larger public, that most students are capable of doing much more than they have been doing. We have got to set high standards.

And these are not special [INAUDIBLE], caution us on that, because we keep saying. Most of the time we start talking about standards, we're talking about a special meaning.

This Task Force is dealing with raising the educational levels of all folks, but with particular emphasis on the fact that minorities and women and the handicapped can be taught very well, and to the extent that we can work with you on getting that message out, we ask you to call on us, and I'm sure we're going to call on you [INAUDIBLE]. I don't want to take more time [INAUDIBLE].

DR. CLIVE: First of all, I want to say that it is about time that this Task Force recognizes the importance of involving people from my Alma Mater, the University of Michigan. [laughter].

The quality of the presentation is long overdue.

However, I'd [INAUDIBLE], I want to ask a question, though, because everytime, Professor Stevenson, that you have said Asian children, you have then gone on to say Japanese and Chinese children.

And the fact is, of course, that although there are a lot of Asians in China and Japan, there are a lot of Asians that don't live in China and Japan, and there are a lot of Chinese that don't live in China.

And in our interim report, we cite a study that shows American students doing as poorly--I'm paraphrasing this--as poorly in math as students from such countries as the Ivory Coast, Hong Kong, and Thailand.

And when I read that, I was brought up short, because, hey, those kids in Thailand and Hong Kong, this must be Asia, they are supposed to be so bright.

What about the non-Chinese, non-Japanese Asians? What do we know about them? Why are they so dumb in Thailand? And is there something special about China and Japan that is different from the rest of Asia?

DR. STEVENSON: Well, part of it is nobody has studied children in other Asian countries, but the Hong Kong children certainly are not [INAUDIBLE], they're, in the IEA studies, they're number one in the 12th grade.

So I think the answer is that to the degree that some of the basic philosophical and cultural aspects of Chinese culture have disseminated, you are going to get the kinds of things that I am talking about, and I don't know much about the situation in Thailand and so on.

But I think that the reason that we mentioned--we shouldn't say Asia, I shouldn't say Asia, I should say Chinese and Japanese, because that is where the studies have been done and I think...

DR. DANEK: I guess maybe, if I could add to the questions, what studies have been done with regard to U.S. Asians?

DR. STEVENSON: U.S. Asian studies are very few and far between. You can get some data from the graduate record exam and some of the college entry stuff, but actually, if you look at the data, you find that no formal studies of the kind we talked about have been done.

DR. DANEK: That's what I thought.

DR. STEVENSON: Except--and one thing that is very interesting, and that is in this big study in Chicago, which involved 20 schools and thousands of children in a random sample, we obviously have Asian children.

And the Asian children in our sample, in mathematics, did better than any of the other children.

But the second thing that's interesting is that the Asian children in Chicago still were significantly behind the Asian children in China, Japan, and Taiwan.

The other thing I would like to say, which I think is very important, and that is, of the 20 schools in Chicago, we had some which were defined as all-Black--85 percent or more of the kids were Black, all-white--85 percent or more white, the rest were mixed.

You would be very interested to know [INAUDIBLE] that the number one school in mathematics in Chicago [INAUDIBLE] all-Black school. [INAUDIBLE] teachers and principals who were very involved in the activities of what we were going to do with that, of what is going on.

In fact, that's why you get that performance. It has nothing to do with an inner-city school.

DR. ADAMS: Could you [INAUDIBLE]?

DR. STEVENSON: Well, I could tell you. I think really [INAUDIBLE].

DR. CLUTTER: Do you think that there is any evidence that shows that the Japanese and Chinese pay a price at the other end for this early, early high performance level in mathematics?

DR. STEVENSON: That is the inevitable question. I think one thing that if everyone realizes, there is concentration on academic life and a very hang loose attitude outside the academic.

So there is not, you're whole life is cancelled. In elementary school, [INAUDIBLE], I just don't see any cost, I don't see they are a nervous wreck, they are not killing themselves.

We do know that, for example, everyone says, "Do we want your high school kids to kill themselves?" That is ridiculous. The suicide rate in Asia, in Japan, for example, is lower than it is in the United States at the present time.

Thirty years ago it was very high, but it isn't any more. And so I don't know. But that is the next study we are going to do. The kids we have been studying will be in the 10th grade.

MS. EMERY: Dr. Stevenson, recent studies have pointed out the central relationship between the mother and the child in the high achievement of Asian children.

Would you comment on this development, this relationship between mother and children, child, and working mothers?

DR. STEVENSON: OK, there is no indication among any of the data that I have seen that working mothers or non-working mothers differ in the consequences--there are different consequences for the child.

Because you have to distinguish between two kinds of time, that is, available time--that is when the mother is available. That clearly would be a difference between a working and non-working mother.

The other is one-on-one time. And there is no evidence that one-on-one time differs between working and non-working mothers.

So that, even though, that is, they can spend as much time in direct interaction with their children. So that Asian mothers, Asian--Chinese and Japanese mothers--are working more and more, but we don't find any difference in the achievement.

We have done all the analyses, thousands of cases, don't find differences between working and non-working mothers in the children's achievement in any one culture.

DR. ADAMS: Did you have one?

MS. BISHOP: Yeah, just one observation. You said you were going to move onto the high school. I'm aware of some studies that have also gone on at the college level, which shows that while they have been very concentrated in the low levels, when they get up to college it's almost like a picnic in a, if I may use that loosely.

I don't know what that means, but apparently when they get to high school--they do all of this 12 years worth of work just to get into college, and then when they get to college, then they relax and hang out and have a good time.

DR. STEVENSON: Yeah, that's--that sounds like Japan.

MS. BISHOP: Yes.

DR. STEVENSON: You're not correct if you talk about Chinese in China and Taiwan.

MS. BISHOP: That's in Japan.

DR. STEVENSON: It's a Japan thing, and the assumption is that this is four years of development. There is no college, there is no university. The problem is we're always talking about high schools and elementary schools--that's where most of the citizens are educated.

But when we talk about universities, what we're producing in America at universities is not really to be compared with what is produced in Asian universities. They just don't have that kind of university education.

But in Taiwan and China, they still work very hard at the university level.

DR. MALCOM: Where can we obtain copies of your studies in...

DR. STEVENSON: Well, [INAUDIBLE], you can write to me and we'll send you a copy.

DR. ADAMS: Thank you very much. Our next presenter is Dr. Rita Colwell (Marine Bio-Technology), Vice President for Academic Affairs, University of Maryland, and we're not sure.

SEVERAL VOICES: She's not here.

DR. ADAMS: We understand that she might be a little late. She's not here yet. We'll gone on then and come back to her if she should come in.

Ms. Freda W. Kurtz, National President of Federally Employed Women, and she is going to talk to us about women employed in the Defense Department. Ms. Kurtz, thank you very much.

MS. KURTZ: Mr. Chairman, members of the Task Force, Federally Employed Women was formed for the purpose of eliminating sex discrimination in the federal government workplace.

The organization is comprised of more than 100 chapters located across the nation and overseas where there are large numbers of federal employees.

Although membership in the organization is open to both men and women, the members are predominantly women. Membership consists of employees in all grade levels and in most job categories.

I am speaking today in my capacity as National President of Federally Employed Women. In July 1988, I will complete my second term as National President.

During my tenure, I have visited as many local chapters as possible and have participated in numerous regional activities.

In 1986, 860,000 women worked for the federal government, comprising 41 percent of the total Civil Service.

In the federal government women's employment patterns are similar to those of women who worked in the private sector, in that men and women have traditionally held different jobs.

Federally employed women are overrepresented in the clerical occupations and underrepresented in the professional and administrative occupations. Time has done little to correct this occupational segregation.

Although it is true that women have begun to enter many non-traditional occupations in the federal government during the past 10 years, it is still true that women have also continued to enter the traditional female occupations in greater percentages or numbers.

The occupations where women predominate are lower paid, lower wage jobs than those jobs where men predominate. In fact, it has been shown that the more women in an occupation, the lower the wage rate.

The average salary for women in the federal government in 1986 was $21,190 per year, as compared to an average salary of $30,590 per year for men.

Jobs within the science and engineering occupational categories are ones in which women have been historically underrepresented.

As in the educational systems and the private sector, women in the federal government have made some progress in the science and engineering occupations. From 1976 to 1986, women dramatically increased their participation in the professional occupations of medical officer, veterinarian medical science, and chemistry.

Women also increased participation in the professional occupations of general biological science, general engineering, civil engineering, electronics engineering, and mathematics.

The proportion of women in the technical science and engineering occupations is greater than the proportion of women in the professional occupations.

Women comprise a large percentage of the employees from the biological technician, physician's assistant, mathematical technician, and physical science technician categories.

Women's participation in the engineering technician occupation is much lower than any other technical jobs, but this also shows increased numbers over the past 10 years.

Occupational segregation is a very persistent phenomenon and penetrates every aspect of the work force.

Studies have shown that women in science and engineering occupations in industry are more likely to be in the lower paid, reporting, production, and inspection jobs, while men tend to occupy the higher level management and research jobs.

As with all occupations, women in science and engineering earn less than men in every field of science and engineering, except nursing, if you want to call that a science field.

In every employment sector, at every degree level, as well as at every level of tenure.

In the professional science and engineering fields women earn 75 percent of their male counterparts. In the technical science and engineering categories, where women comprise a much larger percentage of the occupational work force, women's salaries are more closely correlated to their male counterparts.

The one exception to this observation is in the job series entitled "engineering technician," where women remain only 9 percent of all employees in the occupation.

As I have already stated, Federally Employed Women is an organization devoted to eliminating sex discrimination and providing equal employment opportunities for women in the federal government.

FEW believes that aggressive actions are needed to increase the number of women in the science and engineering occupations.

Even if we assume that women now in the elementary and high school levels are going to choose math and science, and the federal government waits until these young girls presently in elementary and secondary schools earn their graduate degrees, the number of women in science and engineering occupations will certainly remain low for very long periods of time.

Programs to encourage adult women to enter these occupations must be implemented now. The Department of Defense has instituted several successful, innovative programs that encourage women to enter the science and engineering job categories.

And I have just a few examples. The Corps of Engineers has made a commitment to increase its number of women employees in the professional engineering job series. The Corps has started a program in which it examines its existing work force for women who have a natural affinity for math-related skills.

And the Corps sends these women to school, so that they may obtain the necessary degrees to enter the professional job series.

Another program that the United States Navy has adopted centers around the prospect of co-op education. The Navy accurately recruits women students majoring in science and engineering fields for a program that will ask the students to work for the federal government for six months of the year and attend school full time for the other six months.

Strong affirmative action programs and the removal of sex discrimination must accompany training and educational initiatives for women if they are to become fully integrated in the science and engineering occupations in the federal government.

In summary, progress has been made in that the numbers of women in the science and engineering occupations in the federal service are increasing, but that progress has been slow, too slow.

There is a need for aggressive action to encourage women to enter and manage to stay in the science and engineering occupations.

And I am recommending continued emphasis and increased emphasis on programs such as providing educational opportunities, enforcing affirmative action programs, removing barriers to jobs, eliminating sex discrimination, nurture talent in the existing work force, and expanding part-time professional job opportunities, as well as creating role models to increase the number of women scientists and engineers in the federal government.

From the time they were girls in elementary school to the time they enter the work force, it is necessary to let them know that they can be doctors, research chemists, mechanical engineers, veterinarians, plant biologists, petroleum geologists, physicists, astronomers, hydrologists, or whatever they choose to be.

And in view of these presentations that we have just heard, I would like to add that three weeks ago I was in Japan [BELL] and had the privilege of visiting a girls' high school. And I was much surprised to see their girls were being taught math at a very much higher level than the high schools in the United States, even for classes that are mixed boys and girls.

DR. ADAMS: Thank you very much. One comment I would like to solicit from you or just have your reaction to, that might help us on the Committee.

We have a number of persons testify as to ways we can remove barriers for people moving in occupations within the federal government. If you had to write a recommendation, what might that language be, for us?

If you could tell us something that you would include or a statement that you might make. How might federal agencies respond to the fact that barriers continue to prohibit women from moving into--advancing themselves within the federal agencies?

MS. KURTZ: I think a lot of it has to do with the supervisory philosophy, on the first-line supervisors, and, of course, on the second-level supervisors and higher echelons of the management.

If in the delegation of work or the making of assignments, women are not given the same caliber of assignments that men are given at the entry level of science and engineering.

They are not going to be in a position to be competitive for promotion when the time for promotion comes. So that they are not in a competitive position to move upward on those career ladders.

I think it is very important that we get women qualified for the entry level. But it is also important that we give these women the kind of assignments which will help to expand their career and their capability and make them competitive for promotion.

And that depends on the supervisor.

DR. ADAMS: Any other comments? All right, we thank you very much for your testimony.

Dr. Colwell, I think, has now arrived, and we welcome you. This is Dr. Rita Colwell, Vice President for Academic Affairs, University of Maryland, and she is going to talk about women and minorities in resources sciences for recruiting [INAUDIBLE].

DR. COLWELL: Thank you very much. I apologize for being late, but it's so difficult to get to get from Washington, D.C. to Baltimore in 30 minutes, as I discovered. [laughter]

I am going to speak extemporaneously. I have not [INAUDIBLE] but I feel very strongly about the subject, so it is not really difficult for me to pull together some strong opinions, if you will, about what the problem is and what suggestions I would offer for at least a partial solution.

I am sure that you have discussed already today the difficulties in socialization and the effects this has on women and minorities, that girls don't do math and Blacks and Hispanics can't calculate, and that's one of the things.

These kinds of [INAUDIBLE] affect, even now there is no women and minority [INAUDIBLE] of science at the preschool level, at the elementary level, and instead they have to be in high school level.

And once you've done that, what you try to do at the undergraduate level is really remediation. And I think what we must do is to institute perhaps what I think the evidence suggests is very effective [INAUDIBLE].

You've got children in which, in areas where there is a [INAUDIBLE] in subsequent years, I think that once you've tracked women and minorities out of mathematics, elementary chemistry, and elementary physics, you can track them out of [INAUDIBLE] careers, permanently track them out of the capability to compete in science and engineering.

When we do that early, then [INAUDIBLE] cannot really choose to go back without enormous effort and commitment to go into the science and mathematics and engineering track.

And this permeates all the way to the undergraduate level. I was really shocked when I served on an accreditation committee to M.I.T. Well, obviously, M.I.T. is going to be accredited [INAUDIBLE], and took advantage of the opportunity to talk with women students and women faculty.

I was appalled at the lack of self worth that the women students, who had been highly successful [INAUDIBLE], the lack of self worth, the career goals were not to go on to Ph.D. [INAUDIBLE], and I thought, my goodness, if this is the fact for women at the highest level at one of our best institutions, then imagine what it is like at the beginning stages of education and at the other institutions which don't have that high selectivity factor.

One of the experiences which is most important for scientists and engineers is the undergraduate research experience. I cannot emphasize that more.

The opportunity to work in the apprenticeship level with scientists and engineers, as an undergraduate, that is [INAUDIBLE] to be one of the motivating, highly motivating effects that a youngster could have, to learn how it's done, to get inspired, and to share the joy of discovery, to learn how the science actually, on a day-to-day basis is carried out, and to do the experiments.

Even if it is only a very modest effort, that is a kind of involvement that can attract students to science and engineering education.

And I'm very proud of one of the programs we've initiated with the Community College of Baltimore [INAUDIBLE] Center, which is located on the fifth floor of this building, which is undergoing renovation. So there isn't too much to see, but in the fall, we will have a lot to show you.

Nevertheless, we have worked with the Community College to develop a two-year program for technician training, where the first year or so is on the Liberty Hill campus, and the students then in the third and fourth semesters then can work in the laboratories with the faculty to gain experience and to gain credit towards their two-year program.

This allows them to be [INAUDIBLE] industry, which means a reasonable salary for the entering student, but also for the very good student, there is a possibility of tracking into the undergraduate program at the University of Maryland-Baltimore County.

The first [INAUDIBLE] in biology. And then again if a student does well and gathers a B.S. degree, there is the opportunity for the master's in plant microbiology in the university [INAUDIBLE] program in cell microbiology.

Now that is tracking at its best, because the options are there for the student to stop at a technician level and earn a reasonable salary, to go on at whatever level that the student can accommodate.

These kinds of [INAUDIBLE], I think, are very, very important because we need, because of the problems [INAUDIBLE] spoken of and that you have heard about, dropping out of the field, we need a way to track that in.

And I think the community colleges [INAUDIBLE] is a very good way to do just that.

There are some subtle things happening that you need to be aware of, or at least look into. The foreign student influx into the university system of the United States. We should welcome that, but we should understand that the foreign students become the graduate teaching assistants, and they then carry with them their biases and their social customs which in, unfortunately, is often negative toward women and minorities.

So we have got a domino effect, that what is already happening, this decline, is accelerating. And I think you must examine that. You must figure out ways of assimilating these new people, these new citizens, in ways that will be positively reinforcing, not negatively reinforcing, this difficulty that we have in getting women and minorities into the program.

I don't think it is malicious or [INAUDIBLE]. I think it is just, again, the socialization [INAUDIBLE] ignore, not deliberately, but simply because for those students it just isn't necessarily important in the teaching process, and certainly the minority student, as well.

It is insidious and we want to examine and we must train out of the [INAUDIBLE].

Math teaching has got to change. Math, I think is the most important fundamental underpinning of science and engineering and every student must have, not just arithmetic, but algebra, and according to their ability--and I think most students have the ability--to do calculus.

If you don't have mathematics, you have to get out of science and engineering. So we must be mathematically literate. Fortunately, there is a [INAUDIBLE] mathematical sciences 2000, which is to work on this problem, and I would urge you to address it as well.

Because without being trained in mathematics, you cannot function effectively in science and engineering.

And I would suggest that some high school apprenticeships would be a very good way for bringing students into the world of science, and understanding scientists are not just weird people, but they are everyday people who pay bills, raise children, and so forth [INAUDIBLE].

And I think this [INAUDIBLE] can be very effective at the high school level. Science [INAUDIBLE] can be a source, a very cost-effective source, of training students and parents. It can be a very effective way of the parents under the guise of being the [INAUDIBLE] and student.

And the, and times to do some of these experiments that the kids were doing, perhaps to sort of get them--reinforce what the students learn in the science museum.

Finally, I am very impressed with what has been done at the Maryland Academy of Sciences in Baltimore by the National Aquarium, and they are teaching in the Chicago Museum of Science and in the Boston and San Francisco museums.

These perhaps could be a cost-effective way to bring to the junior high--grade school and junior high and high school students--access to the very expensive equipment, the very expensive demonstrations that every high school cannot afford, the school budgets cannot accommodate in this kind of constricting budget.

But they are teaching is extremely effective, and that could be a part of [INAUDIBLE]. You want to bring the science reserves into the high school curriculum as a part of the education process.

This makes it [INAUDIBLE] for parents, and this is clearly an important activity. We need to have an intelligent, informed, educated learning public to support the activities in science and engineering, and I think that is one way to do it.

I think we have to understand that, as you have heard over and over again, and bears repeating, that the Lord does not give all the brains to one community--She [INAUDIBLE] [laughter] [BELL] to women and to minorities.

And we don't take advantage of this resource, but we can no longer afford to be wasteful. We no longer have what happened to me--I was an undergraduate and asked for a fellowship at Purdue University and probably [INAUDIBLE], but 20 years ago, I was told, "We didn't waste fellowships on women."

Now, they would never dare say that, nor would they even care to say that now, but we mustn't ever allow that to happen again. Nor to say we're going to waste them on Blacks or Hispanics.

We must understand that the resources are a national resource, that we must make every single effort we can to bring the brightest and best, of which we have many of all colors and of both sexes, [INAUDIBLE]. Thank you.

DR. ADAMS: Who would like to [INAUDIBLE]?

DR. NOONAN: What percentage of the students who declare as freshmen in some sort of science field as a major or as a proposed major, what percentage of those students actually--at Maryland--actually graduate with a major in science? Do you know?

DR. COLWELL: I'm not, I don't--I can't give you the figures for certain [INAUDIBLE].

DR. NOONAN: Is it your impression that it's small?

DR. COLWELL: It's certainly small as a major field. I would say that the numbers of women majoring in...

DR. NOONAN: [INAUDIBLE] overall--students, males, females, whatever.

DR. COLWELL: [INAUDIBLE]. Now in my...

DR. NOONAN: Why? Why is that? My question is where do they get lost in the process [INAUDIBLE]?

DR. COLWELL: It really happens before they [INAUDIBLE] university, because their mathematics, chemistry, and physics training would probably be marginal, if it exists, in many cases. And I think that that probably [INAUDIBLE].

The results are--I see it in my own graduate students. When the women students go into a laboratory, then tend to be very inhibited and ask permission to use [INAUDIBLE]--and you just say, hey, I know it's my turn, and they want [INAUDIBLE].

And I think that kind of socialization [INAUDIBLE], inhibited.

There is also some of the microbiologies [INAUDIBLE], for example, that in order for the Society of Microbiology have 35,000 members, 6,000 women. So, there is a higher proportion

[INAUDIBLE].

There's just this one [INAUDIBLE] science, molecular science, and an entre into good paying positions, positions of responsibility. It is not the basic chemistry you [INAUDIBLE].

DR. JENKINS: I was wondering if the University of Maryland, or any other university that you are aware of, recognizes this deficiency in the math and sciences of women and minorities right up front, and establishes either remedial or supportive kinds of courses to bring them up to par?

DR. COLWELL: Yes, in the case of minorities, we're proud of our record on retention of [INAUDIBLE], retention is very high, and our proportion of [INAUDIBLE].

There are two kinds of remediation. One is deficiency remediation and the other is a socialization remediation. [INAUDIBLE] the fact that you're coming high schools where they simply don't have the science courses.

[INAUDIBLE] the local high school to [INAUDIBLE] science. In fact, high school [INAUDIBLE] from students to the university for visits to [INAUDIBLE].

Does that answer your question?

DR. JENKINS: Yes, partially. Do you want to speculate why the number of women going into engineering has slowed in the last half decade, and they are not increasing their numbers the same way they were earlier?

DR. COLWELL: I can speculate that [INAUDIBLE] referred by Betty Vetter, of course, when, for example, much of the engineering, two-thirds of all graduate students and faculty are foreign students. [INAUDIBLE] increase in engineering is going to take a lot, there's a possibility that the increase in foreign students.

I think it is a socialization factor, but probably a powerful one. [INAUDIBLE] a non-reinforcement for success, a non-reinforcement as achievement, and lack of encouragement that can be very, very destructive. I think that can be projected.

And I would suggest that may be a strong factor, and there are probably other factors [INAUDIBLE], but it is one of the more [INAUDIBLE].

DR. DANEK: I guess--I totally agree with you about the comments of minority involvement in research, particularly at the high level and those sorts of things, the research experience of the undergraduate level.

?: Mike.

DR. DANEK: The research experiences at the undergraduate level. I guess what I'm looking at is asking you, what sorts of reward systems do you know that universities are putting in place, that the University of Maryland is considering looking at, that would encourage faculty, who have to produce in a very short period of time in order to keep their grants, to encourage them to include more undergraduates and more high school students in their research?

Because I think that is a key problem we are going to have to solve.

DR. COLWELL: The National Science Foundation has developed a [INAUDIBLE] funding for undergraduate programs.

DR. DANEK: I understand that, that even with that, there is still a large number of faculty who may take undergraduates but they are not going to take high school students because they take so much time and effort.

I'm looking at--even though it's just $4,000--where are the rewards of the university thinking about, or have they even begun to think about it?

DR. COLWELL: Well, I doubt there is really any [INAUDIBLE] that I can point to [INAUDIBLE]. I would say that [INAUDIBLE] high school students, in my experience, to be very effective--as a matter of fact, I can just [INAUDIBLE] tell you that I know that a high school student going into a laboratory can be turned on. I have a daughter who is [INAUDIBLE] in a Ph.D. in microbiology and it is because [INAUDIBLE].

[INAUDIBLE] high school teachers' program, a seminar to interest teachers in math [INAUDIBLE]. We should go back to enrichment for high school teachers. This is one of our most important programs [INAUDIBLE].

DR. NOONAN: I see the talent over there, but that's not the question. The question was, does that person who takes a high school student with him into the laboratory get [INAUDIBLE] tenure? That's the point.

Does the university provide a reward system for that person? Does that person get points on their tenure because they have devoted their time to teaching high school students how to do the research? Rather than devoting their time to the graduate students and producing publications.

DR. DANEK: To the foreign graduate students.

DR. COLWELL: [INAUDIBLE] In one instance, a very bright young undergraduate student, a student [INAUDIBLE]. A high school can, if they are [INAUDIBLE], contribute to the research.

And I think in that way students [INAUDIBLE].

DR. JENKINS: I'm sorry to do this and to monopolize your time. Should this Task Force recommend that federal agencies that give research grants and awards to universities require them to put minorities and women not only in their classes, but also in their assistantships and research assistants, and to make sure that they come out with Ph.D.s?

DR. COLWELL: I have to be very careful in this answer because [INAUDIBLE] and I think we should put the attention to improving the quality of high school teaching in high school and stimulate them at the high school level.

I think the pipeline. I think to convert the university to becoming what the high school should be is not the answer.

On the other hand, I do think that in some [INAUDIBLE]. I think there are ways or programs to do a fantastic [INAUDIBLE]. I think that there should be

[INAUDIBLE], that it is very important to track those very advanced students, and to make sure they have experience [INAUDIBLE].

DR. ADAMS: Let's go to...

DR. CLUTTER: I just want to make one comment, for those of you on the board who don't know. Dr. Colwell is on the National Science Board, the policy making body for the National Science Foundation, and I hope that she will help us to implement the recommendations that this Task Force makes.

DR. COLWELL: Thank you, as you know, I'm a graduate science and engineering education and [INAUDIBLE].

DR. MALCOM: I have a concern that really picks up a part of the question--I think it is a comparative thing, too. While I agree with the fact that you can't really expect the universities to take on a role that is not really its primary kind of function.

If we say, for example, that we doing a graduate education is a primary function, that they support the infrastructure, isn't that a primary function that ought to be on a research grant?

That is, how do we deal with the fact that in 1986 the Ph.D.s who were awarded to Black students in the physical sciences--because I know that this is something that has been, that has dependent, it varies by subject area--but they were half as likely to receive research assistantships as their primary source of support as white students or as Asian students or foreign students.

DR. ADAMS: Right, [INAUDIBLE] foreign students.

DR. MALCOM: I think that that is a question of requirement that really is, needs to be addressed.

DR. COLWELL: I'll speak to that directly to say that [INAUDIBLE] special fellowships for graduate fellowships for minority students, and [INAUDIBLE] that the problem is--I think that it is [INAUDIBLE] to go into science and engineering.

I think that that's where it is so key that the elementary and high school level...

DR. MALCOM: No, but [INAUDIBLE] we can follow and make that choice, and then the graduate programs, a graduate program in the physical sciences in our reseach institutions to pursue a Ph.D., and the ones who got the Ph.D. in physical sciences in 1986, the Blacks, they were half as likely to have research assistantships--half as likely.

We know that different kinds of money have different kinds of effect, not only on your rate of completion, they were more likely to report self sources of support, and family, home and family sources of support as primary than other students.

[Several people speaking at once.]

DR. COLWELL: [INAUDIBLE].

DR. ADAMS: But the reason that this point is so important, I think, for persons on this Committee, I can name for you right now students who have 4.0s, so we are not talking about students who are under the [INAUDIBLE]. These are 4.0

graduating students who would like to go to graduate school--will not get a research assistantship at the university.

If they don't [INAUDIBLE] that fellowship program, they won't go at all. And when you come to outside money, you have got to be tied to a professor. You are not on a research project. You are not in a lab tied to somebody who it is their responsibility to get you out.

And so when they treat you as a second-class citizen, you don't belong in this laboratory because you are a special student. And so even when you get a National Science Foundation fellowship, you have to go beg somebody to let you in as a legitimate student, where you [INAUDIBLE], unless they decide [INAUDIBLE] because you belong to a professor.

In the sciences, you get out because some professor wants to get you out, and you get your name on a research proposal, you get a research topic, you get them into--all that comes with [INAUDIBLE], it does not come with exercises [INAUDIBLE].

So I am concerned here [INAUDIBLE] end up saying, let's don't talk about those students who don't qualify--we're not talking about. [INAUDIBLE] We're talking about the 4.0s who have who have demonstrated that they can do the work.

DR. COLWELL: May I offer a suggestion?

DR. ADAMS: Yes.

DR. COLWELL: I would like to see a linkage between the historically Black undergraduate institutions and the leading institutions through a program of faculty exchange, because that is how you get to know who the good students are.

You can't have a professor from a university who spends time [INAUDIBLE], well, I know his or her students. That would be one of their students.

DR. ADAMS: That sounds good, but if I were--we don't have time to do that, right now, I can name you students, these are [INAUDIBLE]. She has got a 4.0 in chemical engineering--this is a white school--no [INAUDIBLE].

Cheryl Harris, she's got the same problem, Cheryl Harris, University of Tennessee, 3.97, no [INAUDIBLE]. These are students right on campus.

So what we are trying to say is if those students can't get some money, we are never going to get the 2.7s. We don't need to discuss that further, but I think those people would say to you--the question we are asking, what can we do as a Task Force to make certain that those students are not overlooked, because the best thing about graduate school is to get [INAUDIBLE] up front. [INAUDIBLE].

On that note, we need to take a five-minute break and [INAUDIBLE]. We look forward to testimony [INAUDIBLE].

[BREAK]

DR. ADAMS: We will continue. Our next presenter is Dr. Janice Petrovich, who is Director of ASPIRA.

DR. PETROVICH: Deputy National Executive Director, and also Director of the ASPIRA Institute for Policy Research.

DR. ADAMS: OK, I didn't have all that down here.

DR. PETROVICH: I know. [laughter]

DR. ADAMS: And is going to address us with some concerns and issues facing the Puerto Rican citizens as they move into science and math.

DR. PETROVICH: Good afternoon, Mr. Chairman and members of the Task Force, I am pleased to be here.

DR. ADAMS: Could you pull the mike just a [INAUDIBLE].

DR. PETROVICH: Sure. I am very pleased to be here today to discuss ways of expanding the education of Puerto Ricans and other Hispanics in science and technology careers.

As you may know, and by way of brief introduction, ASPIRA is a community-based organization whose mission is the socioeconomic development of the Hispanic communities in the United States.

Founded in 1961, we now have associate offices in five states, Puerto Rico, and the District of Columbia, and serve over 16,000 Puerto Rican and other Hispanic youth a year.

Our services are aimed at developing the leadership potential and enhancing the academic achievement of Hispanic youth. Over 250 professional staff offer counseling, tutoring, career guidance, and leadership development services, advocate [INAUDIBLE] improvement, and conduct research on educational issues.

In my remarks, I wish to talk upon brief areas.

First, I will give an overview of some aspects of the Puerto Rican population that are relevant to the work of this Committee.

Second, I will briefly state some of the major areas for increasing the concentration of Puerto Ricans and other Hispanics in science and technology careers.

And finally, I will present some recommendations regarding the concentration of Puerto Ricans in science and technology.

Let me begin with some facts about the Puerto Rican population. Puerto Ricans are a rather diverse and highly mobile group. Our color, physiognomy, and culture reflect a mix of native Indians, Blacks slaves, and European colonizers.

Although we are all United States citizens from birth, some of us come to the mainland only to visit. Others migrate as children with our parents.

Others are born here [INAUDIBLE] their parents. Still others spend their lives going back and forth every few years in what has been described by some researchers as a circular migratory pattern.

As the migratory patterns of Puerto Ricans in the United States mainland differ, so do our degree of adaptation to the United States, our ties to the Puerto Rican culture, and proficiency in English.

The Puerto Ricans most familiar to you may be those who are the offspring of poor migrants and who live in large metropolitan areas such as New York, Chicago, Newark, and Philadelphia.

Saddled with the burden of poverty, affected by discrimination, they face the difficulties of many ethnic minorities in the United States.

The educational achievement of their children tends to be low, as can be expected due to the low socioeconomic level of their family.

There are other Puerto Rican students, most often the children of professional parents, whose educational achievement is high. Many of these live in Puerto Rico, but come to the mainland for the express purpose of attending college.

They have studied in the most selective schools on the island, where often textbooks are in English, and classes are also taught in English.

Not having to experience the discrimination growing up in Puerto Rico, the idea of being a minority is alien to them. This group of seasonal residents has been growing considerably in the last few years.

Its importance lies in the fact that using aggregate statistics for all Puerto Ricans, the picture may appear rosier than it really is.

That is, these high achievers may be masking a continued educational shortfall of Puerto Ricans living in the United States mainland.

To give another example, graduates of the University of Puerto Rico's highly regarded School of Engineering are recruited in large numbers by the U.S. government and private industry. Reports indicate that up to 80 percent of these engineering graduates come to the United States to work and/or continue their graduate study.

Their presence increases the reported number of Hispanic engineers in this country.

Let me stress that pointing out differences between groups of Puerto Ricans is done with a purpose of recognizing that the underrepresentation of Puerto Ricans from low income families in the science and technology fields is probably even greater than statistics depict.

I would like to discuss or mention some of the barriers to participation in science and technology that Puerto Ricans and other Hispanics face, and I must say that a lot of these are irrelevant, not only for Puerto Ricans and Hispanics, but also to other minority groups.

But before mentioning some of the barriers, I wish to narrate to you a true story, occurring in one of our open schools.

This story was narrated to me by the chair for [INAUDIBLE] instruction in charge of science teacher preparation at a major university. It is a personal experience he has.

The scene is an urban school, where teacher X teaches general physical science and physics to senior students. Because of tracking that has occurred years before, the composition of the physics class is virtually all white.

On the other hand, the general physical science class is about 50 percent black and 50 percent Hispanic.

The physics class is characterized by the following:

First, textbooks are available for all students, and the students are able to take the books home.

Secondly, students are allowed to manage their own assignments, allowing them to proceed at their own pace.

Third, teacher X says it's generally accepted methodology, such as alternate teaching styles, and often walks around the room interacting with students in a friendly and respectful manner.

Four, laboratory activities are executed by the students at their laboratory station with the professor assuming a managerial role.

The physical science class, which is the one that is 50 percent Black and 50 percent Hispanic, can be described as follows:

First, books are kept in the classroom. Students cannot take them home, even on loan.

Second, no attempts are made for individualized instruction. The class is based solely on lecture, and since the students cannot take the books home, a large portion of the class is dedicated to silent reading.

Third, teaching is reduced to lecturing behind the desk with little or no movement about the class.

And fourth, laboratory experiences are demonstrations, conducted by the teacher.

When the university supervisor or student teacher--the student teaching shared with teacher X his amazement at the teacher's ability to change his behavior and treat these two classes so differently, the teacher replied, "You cannot expect any better from these Blacks and Hispanics. These kids cannot handle books and laboratory equipment. They will destroy it."

This story illustrates some of the barriers to minority participation in science and technology fields, which I will now briefly mention.

I'm sure you have heard it before as you have gone around the country, and I won't go into them in much detail, but I will just run them off.

First, there is certainly racial and cultural bias.

Second is tracking.

Third is lack of role models.

Fourth is cognitive differences. Let me explain that what I mean here is that research has shown that the way the [INAUDIBLE] process the information they receive and the way they approach problem solving varies greatly, but educators have defined the norm as the way white males work.

In other words, linguistic interference, and this has to do with the first language of the students and having difficulty in understanding words in the cultural context, if the teaching is in another language.

The use of standardized test scores is also another barrier because we know that Hispanics typically score lower.

And certainly dropouts--of this, I will just mention, that you may know, that Hispanic dropouts in urban areas is between 50 and 80 percent.

Some of the recommendations certainly to address these barriers one by one, but in general I wanted to point out a series of recommendations.

One, that supporting and expanding out-of-school science and technology careers programs for Hispanics is important. Community organizations, such as ASPIRA, have been involved in these out-of-school science experiences for quite a while.

We have a national health career program which is 18 years old, and has a record of success in working with students. We work through schools and colleges, identifying students and providing career awareness and counseling activities, tutoring, test-taking skill development, visits to university campuses, conferences with Hispanic health professionals and such.

These efforts extend from high school through college and into graduate school.

Another recommendation is that to promote innovative approaches, demonstration program for the dissemination of successful models.

A third recommendation would be to focus on preventing student attrition by urging the development of effective schools, in which all students from diverse backgrounds were able to achieve the administrative and staff of such schools, which must have a strong commitment to the equitable distribution of resources among all groups of students.

Fourth, expanding the availability of bilingual programs with Hispanic students. Bilingual education has been narrowly understood as a program for English-language acquisition. It has been limited to the [BELL] most basic subjects. A broader scope is needed to include science and mathematics teaching in Spanish for those who need it.

[INAUDIBLE] topic of my presentation and a few other things I want to mention. Thank you.

DR. ADAMS: Thank you very much. Questions, comments? Yes.

DR. NOONAN: I do have a question on bilingual education and I think you're right. I don't think it is very well understood. But clearly, the language of science worldwide, in science and technology, is English.

And I wonder if--when you say the expansion of bilingual education for science and technology, if you could expand on that a little bit and explain how you can get Hispanic students to deal in the language that worldwide that they are going to have to use if they are going to be scientists, which is English, and they are going to have to understand the context of scientific terms and everything else, in English.

DR. PETROVICH: I realize that that's true. My recommendation is based on what happens when a student comes into a country without knowing the language. They don't always come in as children, as small children. They sometimes come in as bigger kids, who are already having advanced, or could have the possibility of having advanced math, [INAUDIBLE] and so on.

And certainly then have a double problem. They have the problem of learning the language and the problem of learning the course.

At present, bilingual education only provides for a person learning the language. Therefore--except in the very basic grades--therefore, they fall behind. That is, the opportunity for these kids to learn the academic courses is restricted by their inability to learn the language.

Now a possible way to deal with this in the interim is to provide teaching--if there is enough students, of course, recognizing the limited resources to provide teaching in the language that a group of students understand.

MS. MEJIA-WALGREEN: If you were going to ask this Task Force to make one recommendation that you think would help the Puerto Rican students the most, what would that recommendation be, what would you?

DR. PETROVICH: I think it would have to do with increased sensitivity to the needs of the diverse student population, and that is dealing with cultural and racial biases and their effects.

I mean I think the vignette that I just narrated is very illustrative of things that go on. I don't mean to say that this was done in every school, but even if it goes on in one, [INAUDIBLE] in another, it is a terrible, terrible thing.

DR. ADAMS: Thank you very much. Our next presenter is Dr. Barbara Mandula, who is a biochemist in the Environmental Protection Agency, and she is going to talk to us about strategies for recruiting and retaining women.

DR. MANDULA: Thank you, Mr. Chairman and members of the Committee. Although I work for the Environmental Protection Agency, today I'm actually representing the Washington, D.C. chapter of the Association for Women in Science, which we often call AWIS, that's a capital AWIS.

AWIS was formed in 1971 to promote equal opportunities for women who enter the profession and to achieve their career goals. I'm the secretary of the Washington, D.C. chapter.

In my testimony today, I am going to concentrate on recommendations related to women in the workplace, but in fact, most of my comments could apply reasonably well to minority and handicapped individuals also.

The testimony is organized by recommendation, followed by an explanation of why the recommendation is important and what it would accomplish.

The recommendations are organized into subjects, the first few applying to recruitment and advancement, another to ways of organize the meeting, and several to improving the way men and women interact in the workplace.

Because of time concerns, the oral presentation is of course a lot shorter than the fuller testimony that [INAUDIBLE].

The first recommendation concerns the [INAUDIBLE]. We specifically contact schools with large numbers of women students and they [INAUDIBLE] a scientific or technical position.

In addition, they could specifically ask for the names of women and minorities and the handicapped [INAUDIBLE]. They fail to actively seek women for these kinds of positions, either because of their own biases, because of the presumed biases of potential employers, or because they just never thought of it.

An advantage of additional recruiting of women is that it accomplishes many things. You also get a broad view about the kinds of positions that are available and that they might be interested in that they might not have known about before.

The second recommendation addresses requirements for scientific positions. The required qualifications for many positions should be broadened. This recommendation applies particularly to the federal government.

At present, requirements are often narrowly defined, such that only people who have taken a particular career path can meet the specific requirements.

In many cases, women have gotten into their present position by a career path that just wasn't the standard one. Although they may be well-qualified for a position, there frequently may not be a one-to-one correspondence between the very specific qualifications that are listed for a position and the particular experiences of the woman, and therefore, the woman just doesn't [INAUDIBLE].

An example that we know of is that in one federal agency, environmental specialists are not considered as candidates for positions in managing natural resources.

It's very natural that some people who are classified as environmental specialists might be very capable of managing natural resources. And, of course, I think we could probably all come up with many other examples.

Recommendation three is about professional advancement. Managers should encourage women to plan for advancement early in their careers.

Such encouragement is more likely to occur if staff advancement were a criterion in evaluating the manager.

For a variety of reasons, women are often less well-informed than men about the actions that they should be taking to plan for their careers.

Managers can be helpful by discussing advancement possibilities, encouraging women to take training courses to develop particularly useful skills, and by [INAUDIBLE] temporary assignments and other experiences that would be useful to professional advancement.

Both the individual women and the organizations that they work for would benefit if skilled women are permitted to advance in the organization.

And if staff development is used as one of the criteria for judging a manager's performance, then the manager will have great incentive to try and advance the women who work for them.

The fourth recommendation is part of the second step and involves strategy for organizing meetings. When organizing a meeting, a panel, or other such program, select the women and the minorities and the handicapped first, rather than after you have done all the rest of your planning.

A goal of 30 percent of women and minorities and the handicapped is, we think, a reasonable goal.

Persons responsible for setting up meetings and programs sometimes don't comply with Equal Employment Opportunity guidelines. Usually they become aware of this when their planning is almost complete and they find that they have a program with no women and minorities and the handicapped on it.

At that point, there could be a problem trying to add such panelists. The planners may have to make major modifications or even substitute an EEO candidate for someone else.

The problem is compounded because the program has usually been modified to assess the specific expertise of the people selected.

So, towards the end of the planning, the remaining positions are very narrowly defined, and it really can be difficult to find a woman or a minority person to fill this very specific slot.

If the targeted EEO groups were selected early in the planning, the program now would be modified to fit their expertise, and then the rest of the program could be filled with people who are either there or they are not [INAUDIBLE].

This representation has some major advantages. It would be easier to find an appropriate EEO candidate early. Secondly, the recommended procedure would avoid resentment that would occur if there has to be a major overhaul in the plans or a substitute procedure.

Third, this recommendation is something that all of us can implement immediately. As soon as you're in charge of choosing individuals for a panel or [INAUDIBLE].

The last recommendation is a general one. Develop procedures to encourage appropriate behavior and to discourage inappropriate behavior when men and women interact in professional settings.

There are still some men who tell sexist jokes or use unprofessional language or behavior with women. These occurrences should be eliminated.

For example, management and personnel officials need to be serious about responding to complaints and in encouraging appropriate behavior in their areas.

As another example, [INAUDIBLE] at large meetings can show pictures of rosy [INAUDIBLE] strawberries instead of nude women to wake up their audiences between slides.

We hope to that these recommendations are useful to the Task Force. We believe that they can contribute to [INAUDIBLE] and more productive work environments for both men and women scientists.

DR. ADAMS: Thank you very much for your testimony. Are there comments or questions? Dr. Clutter.

DR. CLUTTER: Yes, I was very interested in some of your recommendations about how...

DR. ADAMS: To the mike.

DR. CLUTTER: Oh, sorry. I was very interested in some of your recommendations about how one [BELL] might go about constituting a meeting that would have minority and female representation.

And I wondered whether you have a copy of those recommendations, because I for one would like to give the recommendations to all of my program officers who regularly put together panels and meetings.

DR. MANDULA: Yes, yes. I do [INAUDIBLE].

DR. CLUTTER: OK, if I might just add one thing to what you said. I have found that very, very frequently people who are organizing major national scientific meetings forget to include very highly qualified women and minorities on symposia and various presentations.

And one thing I found very useful is to remind them. Of course it is always useful to be the person who has the money to support the meeting, but it is very useful to remind them that they haven't included women or minorities on their program.

But usually the organizers will say, well, gee, I don't know any. So I have found it useful to have some names of people available, and say, well, don't you remember Jane Smith's fantastic work on X. And they will say, oh, yes, oh, yes. That seems to work.

DR. MANDULA: I should just point out that the person who suggested this recommendation is in fact somebody who has money and has used this very openly to make sure that appropriate women could be a candidate on everything [INAUDIBLE].

DR. ADAMS: Well, I thank you very much for your testimony. And we are down to the last scheduled person [INAUDIBLE] Dr. Lucy Morse [INAUDIBLE] testimony. Welcome and we appreciate your being here. I should say Assistant

Professor, Industrial Engineering, College of Engineering, University of Central Florida. [INAUDIBLE] She's going to talk to us about a program there for reentry of women into the field of engineering.

DR. MORSE: Thank you, Mr. Chairman. I am very pleased to be here today to talk to you about the program Reentry Women in Engineering, and that should be in graduate engineering.

Reentry, in my definition, is a woman who has been out of school for a period of time and is now coming back to school to get, in my case, a graduate degree.

My testimony is going to be objective, but it is also going to be personal. Because it is personal, I feel that [INAUDIBLE].

As the number of potential college students goes down, and the number of women in engineering goes down, one source that we find for [INAUDIBLE]. In the late 1970s and early 1980s the National Science Foundation funded a number of programs, career facilitation, reentry programs, for women.

About 1983, funding stopped. Programs, many of them, just died right there. When not told the explanation of why they did die, some [INAUDIBLE] that they were not successful, and the program that we had to [INAUDIBLE] was one that was in this sort of dying phase.

We were funded out of a joint [INAUDIBLE] funding from NSF and [INAUDIBLE], and we were given a seed grant in

1981, a very small seed, $3,000 [INAUDIBLE].

At that particular time I was a graduate student there in engineering. I had been the only female in most of my classes, and because it was a little obvious that I was a reentry woman, my department chairman said, "Well, why don't you head up this program."

So as a graduate student I became the coordinator of the program.

There are major concerns for [INAUDIBLE]. Now to enter our program you have to have a degree in math, science, or engineering and meet the graduate qualifications for engineering students.

And because of my experience--I had been a math major many years earlier--because of my experience, we had this math review class, and it reviewed the three semesters of calculus and a semester of professional [INAUDIBLE] summer.

And this was the main component of our program. The University of Central Florida is a commuter school, and the graduate students [INAUDIBLE] are largely part-time students, and it has a lot of characteristics of other commuter schools rather than a regular university.

The program also has--besides the reentry program, besides the math course, it has components for professional development where we would introduce different industry speakers to the women.

And this program lasts all summer, how to study, different tips on getting back into the school.

After the summer, these students were cycled into, or mainstreamed into the regular graduate program. And this program is housed in industrial engineering, and with it you could get the master of science degree and options in industrial engineering.

Now we originally started out with 29 students in our summer program, and we ended up with 25 students finishing the summer, two of these being men [INAUDIBLE] we thoroughly enjoyed their company.

Part of this program which I didn't realize at the time until the evaluation committee was we met for pizza, we met for dinners, at potluck suppers at my home. And when the evaluations came out later--this is several years later--this was a major, major component of the programs. And the women really appreciated these opportunities.

The women had come from the home. They had come from being [INAUDIBLE] in the school. They had come from major industries where they are classified as engineers, but yet had never had an engineering course.

And then, for those that hadn't been in school for a long time, just the ability to get with other women and share their problems, share their anxieties--I walked them all through registration myself, just to--college registration at that time at UCF was a real terror, and I think maybe in a lot of schools it is. [laughter]

But I walked them through the registration, and [INAUDIBLE] in the summer with friends and they have been [INAUDIBLE] their different options, and they stayed with those friends and stayed close friends for the next few years.

[INAUDIBLE] women's program. It was so successful the first year that the Department of Industrial Engineering, there was too many of them. There were too many new people coming in suddenly.

And we had to readjust. We needed to pull back just a little bit. We still had them coming in, because we had [INAUDIBLE] women that heard about it. People still came in and I was able to administer the math course to them, and they could continue on into our graduate program and in the graduate options.

Well, [INAUDIBLE]. Almost all of the people have graduated. They have gotten their master's degrees. It has taken some of them a long time [INAUDIBLE], new babies, small children, etc., and jobs.

We are in a highly industrial area down in central Florida, Martin Marietta, [INAUDIBLE], all the facilities there. So that there are a lot of opportunities for these women in their jobs. But as well as being opportunities for the women , those companies are demanding heavy-duty overtime [INAUDIBLE] students.

We started at eight--in 1982, [INAUDIBLE] there were eight women in the graduate program. Now, there are 36 in the graduate program, five Ph.D. students in industrial engineering.

Now, the industry people were very glad to see the master's students, and I read the interview with industry, I took the women around. I found very good jobs very quickly [INAUDIBLE], the type of person you were dealing with, almost all the women stayed right there in central Florida. They were not looking for jobs elsewhere.

As far as the Ph.D. program--even though this is speaking from personal experience--[INAUDIBLE] students don't know what to do with the reentry, all the reentry women in Ph.D. A dean of a large engineering school was saying that there was no way that he could handle an older, or a reentry, woman Ph.D. student.

Another official at a top university said that for reentry women to be applying for entry-level positions is just spinning their wheels. There is no way that they are going to get a job in that fashion.

Now we have five Ph.D. students, and I'm not sure what's going to happen as to their particular job possibilities.

We are starting up [INAUDIBLE] [BELL]. We are starting a new program. We are recruiting the full [INAUDIBLE] of engineering this time. We have more support from the college itself. The research group is going to try to fund us. We have enough money for scholarships.

As a result of my past experience and my first experience, I have two recommendations.

[INAUDIBLE] reentry women and graduate students, help in financing. Again, in the NSF, that's been done before.

Two, assure the reentry from an access to a meaningful career path in the traditional academic world, which is currently not designed for the reentry woman.

DR. ADAMS: Thank you very much. Are there questions, comments? I was glad to hear about the [INAUDIBLE] division. I happen to have a wife who is [INAUDIBLE], who is currently a reentry working on a Ph.D. in mathematical sciences at the University of Florida, and lots of anxieties, but it does work and there is a [INAUDIBLE], but there is not very much support for that kind of thing.

DR. MORSE: There's not support. And really she's going to [INAUDIBLE].

DR. ADAMS: Thank you very much.

DR. MALCOM: I would hope that at some point that she tries to find information on some of these reentry programs that we have supported in the National Science Foundation under the old Science Education Directory [INAUDIBLE], because I think that you will find that they are the programs that we have found [INAUDIBLE] that we have now women who are taxpaying citizens, who pay much more taxes, who have really paid for the investment, the original investment that has made the [INAUDIBLE] programs, and I think that we need to say this, and we need the [INAUDIBLE] be respected, that the reentry women, instead of being the problem, are being seen as an opportunity to deal with some of these issues.

They bring a level of maturity and stability to a work site that you might find--the combined [INAUDIBLE] knowledge and a life experience.

DR. MORSE: I'd like to add, there are not too many programs, there weren't originally that were dealing at the graduate level with this initial NSF [INAUDIBLE]. The one successful [INAUDIBLE] in a state university with Mary Anderson, and she was in industrial engineering also. And I recently talked with her; she is still in industrial engineering, and [INAUDIBLE] were able to go into different options, into different options but within industrial engineering.

So in the most part, we are very much alike, except we are the engineers [INAUDIBLE] College of Engineering. She also had funding and we had no funding, except for the $3,000.

DR. DANEK: How much is your program, managing it, how much is that going to cost on a regular basis?

DR. MORSE: The program that we have [INAUDIBLE] is operated on a shoestring. We are charging for the reentry. For the math [INAUDIBLE], $350 per student, which includes seminars, textbook, 36 hours of teaching, social get-togethers, and the whole thing. And did I say tutoring? Tutoring [INAUDIBLE].

DR. ADAMS: Dr. Clutter, did you still have?

DR. CLUTTER: No, no, Shirley Malcom covered my question.

DR. ADAMS: Thank you very much. [INAUDIBLE] we have some additional persons who have asked [INAUDIBLE] ask all of them to come down and--Dr. Carol Weathers, Thomas Daniels, Marilyn Krupshaw, [INAUDIBLE], Michele Block.

If those persons will come down and we will go--I think if we really [INAUDIBLE] keep this rolling. We will just hear all of them, the individual testimony, and then at the end, like we did the last time, have the questions. So, yes.

We don't mean for this to sound like you were rushed, because your testimony to us is very important, but as you can see, all of us have been doing this a long time today [INAUDIBLE].

DR. WELLER: I'm Carol Weathers from the University of Utah, and I am in the Department of Special Education, and also [INAUDIBLE] at the International Division [INAUDIBLE] in Children.

I'm speaking today from a slightly different viewpoint. Being in special education [INAUDIBLE], which I've watched certain things happen, been faced with certain realities, and among those realities is that, first off, that the mildly handicapped students, what we would [INAUDIBLE] the invisibly handicapped students.

Those with learning disabilities, behavior disorders, mild retardation, and so forth. They receive these services. And to every one of those that receive these services and special attention classes, there is an equivalent number out in regular education classes.

Well, this scared us to death, there is only so much that we can do.

The second thing I would [INAUDIBLE] in high school is that there are jobs that those students shouldn't be doing, and those jobs that most severely handicapped students should have been doing. Most severely mentally retarded, very severely [INAUDIBLE] weren't available, and the reason they weren't available was because there were so many high school students who were graduating and coming out of school with other problems. They were taking those jobs, because they didn't have sufficient math, science, and technical skills to do [INAUDIBLE] jobs.

So they are [INAUDIBLE], and with industry, we developed what we called a Center of Excellence Program in the state of Utah, [INAUDIBLE]-based technical education in transition.

It is--so far as I know, it is the first program like this that has been developed out of special education with the cooperation of industry. So we've branched out a little bit, went up through special education solely, in working with handicapped populations [INAUDIBLE].

We were approached by industry to help them come up with recognized schools, [INAUDIBLE] curriculum at the secondary, elementary curriculum, in their industries, as a matter of fact, and assessment devices that [INAUDIBLE], special education technology, so to speak, to advance technology, training and assessment of employees for prospective and [INAUDIBLE].

We're doing teacher training, [INAUDIBLE] development, and we're doing assessment.

Our research, and not only research, but our practice is [INAUDIBLE]. We've looked at adults, we've looked at adults in advanced technology industries, we've looked at adults who were out working in the work force, and we found that possibly the most important skill that they can have is problem-solving, learning for today.

So, therefore, our assessment and [INAUDIBLE] in that direction.

We have gone into industries and we have done [INAUDIBLE] studies in industries, but we have yet to see exactly what reading levels, exactly what math levels, exactly what practical application levels are involved in industry.

But some of those things have been done, but it never hurts to do them again, just to find out what is peculiar in terms of math and science and problem-solving.

Again, we see this adaptive behavior [INAUDIBLE], ability to adapt to the environment seems to be the most important factor.

With various methods--at the present time we have [INAUDIBLE], and that's all I can say [INAUDIBLE] 228 teaching methods. And of those 228 teaching methods, it is very obvious that some of those methods for teaching math, some of those methods for teaching, for teaching [INAUDIBLE] are appropriate to a number of individuals and not to others. Others are appropriate to [INAUDIBLE]. [BELL]

And I will finish. But the--in working with these methods, I would make one recommendation to the Committee. First, that no one curricular option or [INAUDIBLE] option be looked at as the truth and the light for everyone.

And number two is that the Committee recognize the fact that disabled individuals and handicapped individuals and gifted individuals, although they are all under the auspices of special education, may be very different populations [INAUDIBLE].

DR. ADAMS: Thank you very much. Mr. Daniels, D.C. chapter, National...

MR. DANIELS: Technical Association.

DR. ADAMS: Technical Association.

MR. DANIELS: Before I use my three minutes, let me thank you and your Committee for the opportunity to testify and give you some of my relevant background quickly.

I am the former Assistant Director of Space Technology and Space Systems in the Office of the Assistant Secretary of the Army for Resource Development, and former

Department of the Army Laboratory Director, and the founder of a 20-week minority computer science program in Monmouth College, New Jersey, founder of the federally funded Head Start program in Monmouth County, New Jersey.

Now, my three minutes. [laughter]

Most programs of [INAUDIBLE] generally are started in high schools and college levels. Some start at the junior high level. However, often the lack of math and science skills is somewhat late, and many of these remedial programs, although they have been successful, it is important that we address [INAUDIBLE] in preschool, elementary, and these programs that have been successful.

There is a lot of knowledge and substantial evidence that early intervening at the preschool and elementary levels is most effective. The Head Start and Chapter I programs are primary examples, except that they do not reach enough children.

It is also known that programs that involve parents in partnerships with the education community, private industry, and [INAUDIBLE]--all of those are not only successful, but are necessary ingredients for the country to overcome the projected deficit of scientists and engineers by the end of the century.

Here are my recommendations. The following are recom--elements of a national program to be enhanced at the preschool and elementary school preparation of minorities to take the core math and science courses from junior high school, senior high school, and college.

This program should substantially increase minorities being able to capitalize on current and expanded programs for [INAUDIBLE] science and engineering fields.

Number one, the federal government should add the science element to the national Head Start program, Chapter I, and allied day care programs.

Two, they should support successful indigenous community-based science programs at the preschool, elementary school level. A number of successful programs--the National Urban Coalition, [INAUDIBLE] family math programs, [INAUDIBLE] up in New Jersey that address teaching engineering and computer science, coupled with the college and community-based organizations.

Three, design and develop science [INAUDIBLE] public media, community-based, with training teachers, teachers' aides, and students, using the Sesame Street or a program-type format.

Four, federal leadership should support the establishment of [INAUDIBLE] partnerships with foundations, colleges, industry, media, state and local school boards, science education associations, [INAUDIBLE], science and technical societies, minority science community-based organizations, and minority churches to:

a) design community programs,

b) provide training for teachers, teachers' aides, and students,

c) provide facilities,

d) provide a portable [INAUDIBLE],

e) provide audio and visual equipment,

f) provide support financing,

g) provide student and on-site visits and exposure to high-tech science experiences,

h) support and encourage science fairs and other opportunities for recognition of [INAUDIBLE] at this level.

And five, government, private industries, and [INAUDIBLE] should continue to support research development [BELL] which identifies successful techniques for the program, experiences for minority youth.

This approach could be far less expensive and would reach many children than those currently funded programs. Volunteers from those sectors could be brought to bear on a population which has the most potential for [INAUDIBLE].

The country would benefit from increasing the opportunities for minority students and at the same time [INAUDIBLE] competitive positions. Thank you.

DR. ADAMS: Thank you. Ms. Krupshaw, she is the Program Director for the Science and Engineering Apprentice Program at George Washington University.

DR. KRUPSHAW: I am so grateful to be able to talk, because I was sitting there and the Committee exhibiting an amazing amount of self control. I want to throw so many--I wanted to respond and ask questions [INAUDIBLE]. It's hard.

May I take a moment to just give you background. I am one of those oddities. I had an engineering degree 45 years ago, I guess, when it really was an oddity. You know, one of the founders of the Society of Women Engineers in 1947 and know all that stuff.

However, believe it or not my Ph.D. dissertation is in mainstreaming blind, deaf, and emotionally disturbed children in the sciences. And there was a textbook out, Dr. Doris [INAUDIBLE] was my thesis advisor, and that's the textbook, and I worked with her, so that I feel I sort of got it from both sides.

I [INAUDIBLE] the program I'm doing courtesy NSF. It is the outgrowth of an SSTP program in which high school students, high ability students, were placed in laboratories with scientists for the summer session, and given the munificent sum of about $40 a summer.

Well, I started teaching [INAUDIBLE]--one of my children was handicapped by an automobile accident. Oh, by the way, when a woman talked about role models of engineers, I wanted to wave both arms to that. I've got seven kids and I was climbing oil well rigging in East Texas as an engineer and always pregnant, which drove [INAUDIBLE] service absolutely [INAUDIBLE]. You know, there are things that you can get into [INAUDIBLE].

But to get back to the other--that's how I got into teaching, just as a fluke. My son was going to be in the D.C. Society for Crippled Children from nine to three. What was I going to do in the District from nine to three? I just walked into a high school and I started teaching in Dunbar High School before integration, without having [INAUDIBLE]--Alan picked up on my voice immediately and told me just where he thinks I came from.

I didn't know all the things that could not be done, so I did them all. You know, I had the high expectations, and they did it, because I expected it, and we did all the field trips to Goddard Space Flight and to all the rest of it.

Then the SSTP program, while I was doing some graduate work for the American University, we started out with these students, and my objection was I had students in Dunbar High School who were working at McDonald's in the summer, so they could afford to go to school in the fall.

But they were every bit as bright and had the potential for the same experience in the summer. Why didn't we do it? So we did.

When NSF funding stopped, the Department of Defense said this program is just too good to last. By this time, I was, had begun teaching on the college level because I was one of those who opened my big mouth in front of a hearing on the creation of the Federal City College in Washington, D.C.

My engineering degree is a product of City College of New York. My parents certainly could not have supported my education. Therefore, I wanted into a school where my students from Dunbar could--and so I went to Federal City College.

And I put in my 20 years at the University of D.C.

The programs that we're doing--the department--and Naval Research Lab actually recognized, and NSF money died, they weren't going to let the program go.

So they began funding, the Office of Naval Research. And with the impending shortage of scientists and engineers [INAUDIBLE]--now I can start my three minutes [laughter].

They funded the [INAUDIBLE], which is a great way to put it. Somebody said, "[INAUDIBLE]. Hey, that's it, you're growing your own [INAUDIBLE]." And I insist they select their own student. I'll provide the applications, but they have to intervene, and they have to take [BELL].

May I very, very quickly hit...

DR. ADAMS: Go on, go on.

DR. KRUPSHAW: I have at least 600 high school students this summer. May I say in '86, of the 474 student participants, 38 percent female, 20 percent minority. In '87, we had 560 students, 44 percent women and 23 percent minority.

Some places do better--NRL, they had last year about, they had 41 percent women and 70 percent minority.

I'm missing my third page, which doesn't help very much.

We have two other programs. What happened was the students were getting back into the high school classrooms, talking about what they did, and the teachers would call me and saying, hey, what happens? The kids know more than we do.

So we started a high school science teacher program, whereby the teachers get graduate credits for recertification. They come every Saturday to the university. They also spend the same eight weeks in the laboratories doing research, writing their papers.

They make marvelous contacts for field trips and getting lab equipment and all that.

The third program--I was not getting the representation I wanted from D.C. Public Schools. I love the D.C. system and I was upset about that.

So we started a Career Awareness Program, where seventh grade inner-city kids, whereby we took them away from three days [BELL] and I will stop.

Oh, well, my recommendations will be given to you [INAUDIBLE].

DR. ADAMS: Thank you so very much. It is nice having you with us today, and we do look forward to [INAUDIBLE] recommendations, so be assured that this will get in the report.

Dr. Block. Is this hers? OK, Dr. Block.

Dr. Block is an instructor, Department of Psychology...

DR. BLOCK: Uniformed Services University of the Health Sciences. For those of you who don't know, that's the medical school of the Army, Navy, Air Force, and Public Health Service.

DR. ADAMS: Oh, OK.

DR. BLOCK: Of course, I want to thank you for the opportunity to testify at your hearing.

I want to address what in my opinion is among the most formidable barriers that women face when they enter careers in science and technology. To me, it's obvious. Women bear children.

And I want to address the difficulties of combining a demanding career with child rearing. To illustrate, I want to tell you of my own experiences.

In college, I decided on a career in research science. I entered an M.D., combined M.D.-Ph.D. program. After finishing this, I did residency training in pathology.

And my daughter was born just after my residency. Now, although I am very devoted to my career, I am equally devoted to my children, or child. And I, and many other women, feel that children during their early years require a parent's special attention, and that a full-time demanding job does not leave enough time and energy to do the job right.

So with this in mind, I began looking for part-time work [INAUDIBLE] 30 hours a week in research, teaching, administration, consulting work, government.

After over a year, I concluded three things. Number one, part-time work is absolutely not available. Number two, women who decide to devote time and energy to child rearing are viewed very negatively by the scientific-medical community, and I'm sure this does not come as a surprise to anyone, and number three, the longer I was out of work, the more difficult it would be to return.

And so, when my daughter turned a year and a half, I compromised and took my current position, which although full-time, is relatively manageable.

But in a few years I hope to have another child, and I will quit if I am unable to negotiate a reduced work [INAUDIBLE], start this all over again.

And I think that this is an obvious waste of my 10 years of post-college training.

So I want to make some recommendations. And I think that there are three key words which apply to all the groups that have testified here today. They are "recognize," "respect," and "accommodate" to the special needs of the various groups we are talking about.

Women are different during their child-bearing years, and among the options--we do not have enough options--I would make specifically. If you go around the country and ask, what is a typical maternity leave, you will find a week, six weeks, three weeks.

Four to six months is about more reasonable.

There are very few training programs which could not be done on a part-time basis adequately. I'm speaking of graduate work, post-doctoral training, potentially even academic positions.

There is no mechanism for this currently.

Also, fellowships, grants, career-development awards which all the various science organizations give out, it should be mandatory that those can be held on a part-time basis [BELL]. It's my experience that there are very few projects that are not amenable to work over a slower period.

Obviously there are some hot things that need to be shoved out the door of the lab. There are plenty of things that a dedicated person can do over a longer period of time.

And I think that that should be a mandate, that a grant can be held on a part-time basis. For a post-doc fellowship basis if that's what you want.

Postponement of tenure decisions, and of course, as the speaker before us talked about reentry programs, for those many women who have dropped out over the years and cannot reenter the field [INAUDIBLE].

I think that all of these will make for a much greater increase in the number of women that participate in the science and technology fields, and if you have to bear in mind that the current system was designed by men for men, and if you are truly interested in increasing women's participation, you will have to accommodate the odd, special [INAUDIBLE].

Thank you.

DR. ADAMS: Thank you. [INAUDIBLE] I think that's good comments for us to [INAUDIBLE]. Are there comments? [INAUDIBLE] today, in the course of this morning.

I see that you all did a very good job and so this group recognizes that it is now about six minutes to five o'clock and all of us are trying to get back to someplace just like human beings.

This wraps up our last of seven public hearings that we have had, and I have been asked by the Co-Chairs and my fellow members of this Task Force to express our deep appreciation to all of the persons who have testified before us, specifically for the time and the patience that you had.

Some of you, even today, have been here all day, and we really appreciate that. Some of you have come from a long distance and it might look like it was just not worth coming for the amount of time that we gave you, but be assured that we have listened, we will take the testimony that you have and [INAUDIBLE].

They give this back to us so that we get a chance to see it.

We have been encouraged by the kind of things that you all have said to us. We have been enlightened by your testimony. Much of what you have done to us have caused really us to have opened our eyes in different kinds of ways.

We have not always been sensitive, as you have said, not always been respectful. We have not accommodated people very well, and we are aware of that.

So we appreciate the fact that you continue to challenge us.

This hearing, as we conclude here, there will be a presentation to the public, through the President and the Congress, as [INAUDIBLE] on June 30th. Between now and that time we will have, as a Task Force, we will meet again. That meeting is on the 24th?

So the meeting is on the 24th, but we will get together and actually go back and forth and volley and try to make sure that everybody feels like they get included in the thing that should have been included.

At the [INAUDIBLE] presentation, we are being [INAUDIBLE] until December 31st, 1989, and between June 30th and that time, we will try to figure out some way to give you a message in the summer.

We plan to have hearings--not hearings, but we plan to have presentations at all of the national meetings that we can get into, and I would announce that to you now, that if you belong to organizations where you feel like you want to be in [INAUDIBLE], we will try to have somebody from the Committee or at least some kind of representation there.

We will definitely try to get copies of the report--I hope I'm saying the right thing--to these meetings if you let us know about that.

We will call on you, because this is a joint project.

I think I speak for the members of the Task Force when I say to you that we have spent a lot of time doing this, and I think all of us have done this with the sheer determination that we can no longer continue going in the direction that we are going in. [INAUDIBLE]

There is too large a portion of our population that is not being served very well, and we want to speak loud and clear on that.

I would just conclude this by saying our thrust in doing this is simply that, someone said this morning that when God made man, whatever, and woman, that he did not decide...

SEVERAL VOICES: She.

DR. ADAMS: ...that talent was [INAUDIBLE]--that she did not decide. [laughter] That was [INAUDIBLE].

But, in fact, talent is spread among all of the people on this United States, and that if we are to be the kind of country that we deserve to be, we can do no less than to make sure that that talent is identified very early, that it is nurtured, that it is encouraged, and that it will allow people to become all that they can be.

We thank you very much. We look forward to working with you as time goes on, until the conclusion of our effort on [INAUDIBLE].

Thank you all very much.